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This report was prepared in response to the provisions in the 1965 Programme of Work of the Committee for Scientific and Technical Personnel calling for a review of the Committee's past works on curriculum reform and new techniques of teaching. The scope and purpose of the report are (1) to evaluate past operational work on curriculum reform and new techniques of teaching, (2) to throw more light on the institutional framework through which the planning and implementation of curricular and teaching innovations can be carried out, (3) to outline possible strategies for the effective integration of such innovations in educational policies, (4) to describe the channels and mechanisms through which experience in these matters is made available internationally, and (5) to indicate the areas where international action could be useful and the possible role of the OECD and other international organizations. (HW)

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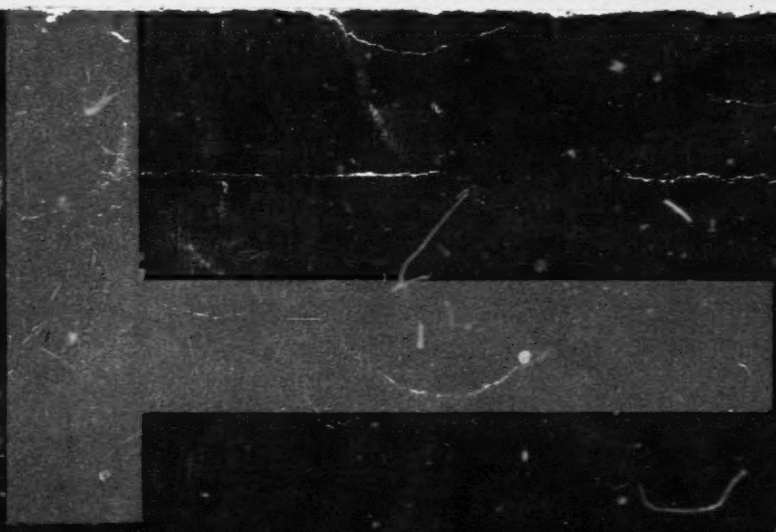

MODERNIZING
OUR SCHOOLS

curriculum improvement and educational development

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ORGANISATION FOR ECONOMIC
CO-OPERATION AND DEVELOPMENT

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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ORGANISATION FOR ECONOMIC
CO-OPERATION AND DEVELOPMENT

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FOREWORD

by Michael Harris, Deputy Secretary General of the OECD

Following on its highly successful programme for curriculum development in science and mathematics at the secondary school level, the OECD Committee for Scientific and Technical Personnel undertook to review its work in this field and to examine the relationship of curriculum improvement to educational planning and development. This report is a timely discussion of the latter question.

All OECD Member countries are committed to a high rate of educational expansion and to significant increases in expenditures for this purpose. It is becoming clear, however, that successful expansion depends on resolving the quantitative problems of growth and on the degree to which the content and methods of education can be made relevant to modern requirements. It is the uniqueness of this report that it endeavours to present these latter aspects, which centre essentially on the curriculum, within the context of overall educational policies, and shows thereby that the "quantitative" and "qualitative" aspects of educational planning cannot be divorced from each other.

The report argues that a new approach is urgently needed to curriculum construction and change, the main principles of which can be summed up as follows :

a) Curriculum development must be seen as an integral and continuing part of educational development policies and of educational planning ;

b) A piece-meal approach to the several disciplines within the curriculum is no longer adequate, and an overall approach to the problem of curriculum development is now needed ;

c) In consequence, Member countries should regard curriculum development as a continuing function which requires appropriate national permanent mechanisms to deal with it.

Perhaps the most important theme running through the entire report is a sense of urgency concerning the measures and attitudes to be adopted if the educational systems of our Member countries are to be endowed with the necessary capacity for change and innovation so that they can adequately respond to the legitimate pressures and demands of modern society. The report is essentially addressed to the various authorities in the Member countries concerned with the planning and implementation of educational policy. I am convinced that it will receive their serious attention both as regards the general statements made in Part One and the more detailed analysis of trends and developments contained in Part Two.

I wish to express the appreciation of the Organisation to the group of experts, Dr. Stoke, Mr. Löwbeer and Rector Capelle for the work they have done, in close collaboration with the Secretariat, in preparing this document.

PREFACE

In 1965, in keeping with its broadening interest in educational development, the Committee for Scientific and Technical Personnel invited a special group to prepare, in collaboration with the Secretariat, a report on curriculum improvement and educational development. The results of this work are presented herewith.

In the preparation of the report we have drawn heavily upon the thought and work of others and especially upon the large number of reports and monographs developed in other areas of the work of the Committee for Scientific and Technical Personnel, particularly in educational planning and development. We wish to express our indebtedness and our appreciation.

Part I is a series of statements of basic concepts and considerations with sufficient accompanying exposition to make, we hope, their intent and meaning clear. We wish to emphasise, however, that these statements, which are the result of prolonged study and discussion, are not presented as educational doctrine to be accepted by every Member country. Rather, it is our purpose to stimulate and to contribute to the general discussion of educational development as a whole.

Part II of the Report contains the information and data which constitute much of the under-structure for the comments and conclusions of Part I. It also presents an analysis of the processes involved in curriculum construction and change and indicates their implications for educational policy on the basis of representative illustrations of developments in the Member countries. In the preparation of this portion of the Report the collaboration of the Secretariat and of the educational authorities of the several countries has been indispensable. It incorporates in particular the work of Mr. George Papadopoulos, Acting Head of the Educational Investment and Development Division, and Mr. Denis Kallen, Consultant to the Directorate for Scientific Affairs of OECD who have borne the burden of gathering and presenting material along the lines agreed upon.

Each of us has, at one time or another, been closely associated with the work of the Committee for Scientific and Technical Personnel of OECD and consequently the preparation of the Report has been a matter of great personal as well as professional interest. It represents a consensus of our views. We present it as a unit with which we are in agreement.

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Former President, Queen's College
of the City University of New York,
U.S.A., Rapporteur.

Hans Löwbeer,
Director-General
of the National Board of Education,
Sweden.

Jean Capelle,
Recteur de l'Académie de Nancy,
France.

INTRODUCTION

A. Scope and purpose of the report

This report has been prepared in response to the provisions in the 1965 Programme of Work of the Committee for Scientific and Technical Personnel calling for a review of the Committee's past work on curriculum reform and new techniques of teaching. The detailed terms of reference for this review, as agreed by the Committee at its 11th session, were to :

a) Table and evaluate past operational work on curriculum reform and new techniques of teaching ;

b) Throw more light on the institutional framework through which the planning and implementation of innovation in these matters can be carried out ;

c) Outline possible strategies for the effective integration of such innovation in educational policies ;

d) Describe the channels and mechanisms through which experience in these matters is made available internationally ;

e) Indicate the areas where international action could be useful and the possible role which OECD and/or other international organisations could play in this work.

In a more general way the Committee recognised that the object of this review would be to formulate some of the issues involved in the qualitative aspects of educational planning and development. These issues, in the context of the rapid educational expansion in OECD Member countries, have a particularly important bearing upon the content of education and the methods and organisation of learning. The report attempts to elucidate these problems by focusing attention upon the curriculum as the heart of all formal organised educational systems, on the need for its continuous study and improvement

and on the implications which all action relating to the curriculum has for both teaching and learning, as well as on the planning and articulation of the educational system as a whole.

In this way the report endeavours to present the problem of the content and methods of learning as an integral aspect of any programme of educational development and to address itself to the general question of how to bring about, within the educational system, continuous and self-sustaining development to accommodate the expansion of education which is being brought about by compelling extraneous forces.

In thus concentrating on these themes the report has placed less emphasis on some of the specific points in its detailed terms of reference. It was felt, for example, that a comprehensive account of the Committee's past work in science education was already available (1), and that consequently there would be little point in going over the same ground again ; comments on this matter have therefore been limited to an illustration of the relevance of these activities to the various issues raised in the report, their impact on policy changes, the validity and the limitations of their approach. Similarly, no effort has been made to spell out explicitly the role of international action in bringing about desirable changes in the content and methods of learning. It is hoped, however, that the report itself, concentrating as it does on national problems and situations, will prove a useful example of the advantages of international exchange and co-operation in these matters and will also provide ample illustration of areas amenable to collective consideration and study.

B. The concept of educational development

This report is attuned to the objectives of educational development policies. These objectives, as formulated in the Committee's long-term approach to its work, are in essence :

a) To devise the methods by which the established educational targets can be achieved ;

b) To find the resources needed for this purpose ;

c) To determine the optimum ways in which these resources could be utilised.

Thus, educational development policy concerns itself with education in all its aspects ; it implies the translation of the targets in terms of the structure of the educational system and the administrative mechanisms behind it - its financing, the construction of school buildings, the content of courses and methods and materials of learning, the flow of students through the educational system, teacher recruitment and training, research and experimentation, etc. It is within this context that the fundamental problem underlying all educational policies, namely, how to develop the kind of education the schools should provide, is being considered. There is a difference between providing schools and providing education. It is comparatively easy to conclude that more schools should be built, more pupils enrolled, more teachers trained. It is much more difficult to decide what these schools shall do to bring about the desired result - the education of resourceful and competent citizens who realise their own potentials and contribute to the development of their communities. What shall the schools teach ? To which students ? For how long ? How can teaching materials be prepared ? How can teachers be suitably trained and retrained ? How can methods of teaching be improved, the effectiveness of learning increased ? Above all, how can the entire process be continuously adjusted to ensure that the education students receive is relevant to their own needs and those of the society in which they will live ?

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(1) This refers, in particular, to the Progress Report, STP (64) 8 (OECD Document).

These questions reach beyond the broad conceptions which determine the shape and character of the school system and which derive from, and determine, the educational philosophy of a particular country. They imply the translation of these underlying conceptions into specific educational decisions, a process which depends heavily upon continuous planning, organisation and administration and which calls for different criteria and expertise than those used in general educational planning. The effectiveness of the whole educational process, however, depends on the degree to which these two aspects of planning - the establishment of goals and their translation into practice - are co-ordinated at all levels. This is in essence the proper function of educational development policies as it begins to emerge in OECD countries.

It is increasingly recognised that such a function can no longer be conceived in terms of ad-hoc arrangements. Education development has not only to keep pace with the rapid evolution of society, to inaugurate newly developed techniques, to follow the evolution of knowledge and methods of communication, to conserve the cultural values of the past and present. It must itself be innovative and forward-looking ; it should anticipate, and even help to bring about developments ; it must, in short, prepare for the world of to-morrow and for the maximum happiness and usefulness of school children in the world in which they will live as adults. Such a task calls for clearly-established and carefully conceived mechanisms and systems so as to ensure that continuous educational development, in line with the regular and continuing process of education itself, adequately responds to the increasingly swift changes in modern life.

Some of the major forces which lie behind these changes, and the bearing which they have on educational development in general, will be considered in some detail under Part Two of the report. Within this general process, the curriculum, because of the central position it occupies in any programme of educational development, should act as the conscious "moderator" of change. For while curricula and teaching eventually adjust themselves to change (it is doubtful if any school still teaches Aristotle's view that the brain is a gland for cooling the eyes. !) the pace of adjustment, sui generis, is much too slow to keep abreast of modern times ; hence the need for deliberate action to hasten and facilitate the process of curriculum adjustment. This is all the more important in view of the fact that major structural and organisational changes in the educational system, involving as they do complicated legal and administrative procedures, can only come about at rare intervals, thus throwing the onus for the needed continuous adjustment of education on to the curriculum itself. In this sense, the curriculum assumes the attributes of a regulating mechanism reaching beyond the formal substance of education and touching the very core of the process through which general concepts and objectives are translated into educational practice and results.

Part One

BASIC CONCEPTS AND CONSIDERATIONS

It is well understood that the determination of the substance of education or the content of curricula is a matter of great complexity. In the following propositions and the comments which accompany them an effort has been made to identify and explore some of these complexities. The intention is to promote educational discussion by focussing it upon those matters which appear to be most pertinent and universal in their implications.

I

Each country within the limits of its resources and circumstances should undertake to provide education for every person in accordance with his needs and abilities, and must plan and implement educational programmes sufficiently broad and flexible to meet its responsibilities.

Societies are coming more and more to look upon their people as a reservoir of talents and skills. It is now generally accepted that these talents are far more widely distributed throughout a population than was formerly believed and that their discovery and development is essential to the progress and improvement of all our institutions. From these changing social and ethical conceptions several important consequences follow. One of these is that the educational system is, among various means, the best by which to discover and develop the talents and abilities of a population and that the educational system must, so far as is possible, be given both the opportunity and responsibility for doing so. Another is the growing conviction that while the same type or level of education is neither possible nor desirable for every person, it is desirable to provide every person with the education to which his needs and abilities are adapted and that failure to do so is both a social and an individual waste. Furthermore, we are beginning to appreciate the fact that raising the level of education for all people is the best means by which the richer and more diversified life which modern developments are producing can be better created and enjoyed.

These considerations impose on our educational systems new and heavy responsibilities. They must provide education for a larger proportion of the population. They must discover the variety of potential talents in such a population and formulate programmes suitable to the development of the skills which societies require and of which individuals are capable. As our societies develop a wider range of goods and services and more complex processes in their production and use, education must provide the training which such operations require. As occupational patterns change, as industrialisation advances, as urbanisation increases, not only will there be a need for higher levels but for new kinds of education. Whether he wishes or not, every member of the community will find himself increasingly affected by changes which in turn will affect his employment, transportation, health, safety, and entertainment, and he will be more comfortable and productive if he is able to understand such changes and to participate in them. This will be true not only of the doctor and the engineer, but of the farmer and unskilled worker, or the housewife.

We believe that every modern society rests upon a basis of competence which can be produced only through education. To produce such a level of competence, the educational system must be so organised as to discover and develop the individual talent latent in society and to guide such talent along productive lines. To perform such a task, an educational system must not only have the active support of society, it must itself be constantly alert to the nature of the responsibilities it bears toward both the individuals and the society it serves.

II

The curricula at all levels of education must be adjusted to accommodate the new and different interests represented in the expanded school population now increasingly drawn from all parts of the community and must make such interests effective by means of aggressive and informed programmes of educational guidance.

Two facts have become universal in the educational systems of Member countries : the first is that a far larger proportion of the school-age population is crowding into the schools. The second is that a larger proportion is remaining (or desires to remain) for a longer period of time. Education is no longer to be confined to a comparatively small proportion of people socially and economically fortunate enough to obtain it. As we have already indicated, new concepts make the spread of education not only economically and politically desirable, but ethically obligatory.

This broad base of education has important practical consequences. It requires more teachers, more schools, greater financial support. It also has profound implications for the work of the schools, the very content of education itself. Schools which enroll a large proportion of the population will be quite different from those which are limited to a small select group. They will be confronted with students drawn from all occupational groups and classes who will have different degrees of ability, different purposes, different motivations and levels of aspiration. In short, the schools will become more and more a mirror of the whole society which creates and supports them.

This fact must be reflected in the curriculum the schools offer, in their teaching methods. A lengthened period of compulsory schooling must clearly have useful consequences if the investment of time and money is to be justified both individually and socially. The schools must be realistic about the fact that they are dealing with large numbers of people who will be engaged in all kinds of occupations and services. The organisation as well as the content of education must reflect these needs ; it must go beyond the "bookish" interest with which education has been traditionally occupied.

As a consequence of providing prolonged and broadened education, the schools inevitably assume a new and important responsibility - a responsibility for educational guidance. Educational guidance involves two major aspects : to forecast the major trends and needs for educated manpower within a given country and to discover the talents of individuals within the school and to provide them with advice and guidance.

These new dimensions of our educational systems are only beginning to develop. The techniques of forecasting are still rudimentary but we have learned enough to be wary of some of the pitfalls. We know, for example, that the long term demand for educated manpower moves steadily upward even though the demand in a given profession or occupation may show a year-to-year rise or fall. We must, however, learn more about distinguishing between short-term, intermediate, and longer-term needs, about the impact of automation on occupations and employment, about the relationships between specialisation and general education, and we must greatly improve our training of guidance personnel and the means of disseminating pertinent information to students.

The techniques for the discovery and development of individual talent within the school population must likewise be more fully developed. By defining and classifying abilities too early and too narrowly such techniques can be a source of discouragement and restriction. In turn, the failure to recognise differences in interests and in abilities can also lead to waste and frustration. The schools must find ways to help students discover their own best interests and capacities and direct them along the lines of their greatest usefulness. We cannot over-emphasise our belief in the great and growing importance of the services of the schools in developing the means of identifying talent and advising individually and socially as to its best use.

III

A satisfactory curriculum must include provisions for the general education which is essential to all citizens as well as opportunities for the discovery and development of individual talent.

It is generally agreed that education must serve the dual purposes of teaching people to be useful and responsible members of the society to which they belong and at the same time providing for the development of the individual talents and capacities which make each person distinctive. The first function has been summarised by the phrase "education for citizenship" and seeks to provide each individual with at least the minimum means of literacy and communication by which be can feel a part of the community and participate in it. This is not a matter of purely mechanical achievement, of reading or writing or vocational training, but of sharing conceptions, loyalties and ideals common to all. This common citizenship is the cement of society, without which it becomes weak and unstable and the prospect of social progress diminishes. In terms of practical education, such social results rest heavily upon a knowledge of the common language and literature of the country, upon a knowledge of its history and traditions, upon elementary mathematics, calculation and accounting. This social equipment is a clear responsibility of the schools.

In addition to its responsibility for teaching pupils the ideas and skills which they need as members of the community, the schools must also provide the means by which each individual can realise as fully as possible his own distinctive capacities. This is important to both the individual and to society. There are wide variations in student ability. These variations are revealed in their aptitudes in various subjects and likewise in their interests and in their speed of learning.

It is important that these differences be recognised and accomodated in the content of the curriculum and in the organisation of the schools. Education is a sorting-out process and competition can be stimulating and constructive. Yet tests and examinations have been used frequently to stop the education of students rather than as a means to discover and encourage their distinctive qualities. Too often examinations, like mass gladiatorial combats, have been used as a device whereby students destroy each other in pointless competition. The schools must provide more channels and fewer barriers to talent. Efforts to help the student find his potential capacity should begin in the period of basic education, but factors governing career decisions are too complex to be final at such an early stage.

As general education embraces a larger proportion of the school population for a longer period of time, the schools must study more carefully the streams which subsequently channel students into their most appropriate edu-

cational and occupational activities. There must be places for the students to go and courses of study for them to follow. While no organisation or programme can accommodate all individual differences, we should certainly experiment with those which would serve the greatest individual as well as social interests.

IV

Curricula must provide for the continuous reinterpretation of presently accepted knowledge and for the rapid incorporation of new discoveries and developments, and the schools must, therefore, accept a corresponding obligation to discard out-moded materials and treatments.

We do not pretend to predict the intellectual preoccupations of the world twenty years from now ; we are, however, confident that, given the continued operation of forces we now see and those we may forecast, they will be different from those which occupy the schools today. The constant and increasingly rapid expansion and reinterpretation of knowledge has created enormous problems. Recently a popular textbook in physics, first published in the United States thirty years ago, was re-issued in its eighth edition. Not only had changes in the field been sufficient to require eight editions in thirty years, but the eighth edition contained twice as many pages as the first. Obviously, it is impossible to continue indefinitely to add pages to books and new courses to new programmes. How then, can such advances be incorporated quickly and effectively into the curricula of the schools ? One answer is by some kind of continuous review of the content of education. The curriculum must be screened with a view to determining what is relevant and useful and what has been superseded. New organisations of knowledge and new systheses must be developed and new instructional materials prepared. In the sciences, steps along these lines have recently been taken. New ways of organising and presenting modern developments in chemistry, physics and mathematics are meeting with success. Preparation of new teaching materials, accompanied by the necessary retraining of teachers, is gaining ground, yet every subject in the curriculum can profit from similar revisions. If the efficiency of learning is to be improved, there must be even more vigorous efforts to discard the outmoded and include the new, to compress and reorganise.

Even so, the speed of change is so great that one may well wonder how schools of today can provide the education which students will find useful

twenty years from now. It is indeed a baffling problem. It can, however, be solved in part if education definitely incorporates in its orientation an acceptance of the principle of change as applied both to its own activities and to the world about us. This acceptance must become a part of modern educational philosophy. If such attitudes can be created and cultivated in the schools, they can be a basis for that continuous education which will enable people to adapt themselves to changing ideas and conditions.

V

Humanities and sciences must be reconceived as essential and complementary parts of a modern education with each area assigned a place in the curriculum and taught as a part of a common educational goal.

It is our conviction that what constitutes an effective education is a matter which requires constant study and reassessment in the light of both the needs of the individual and the social conditions of the day. Knowledge does not grow evenly, and the problem of determining the content of the curriculum and the distribution of time and attention to be given to its different parts is as difficult as it is important. How, for example, should it be decided as to how much mathematics shall be taught, at what levels, and in what form ? Or languages - what languages, to whom, and for how long ? Not only are such questions rooted deeply in tradition and educational philosophy, they have a direct bearing upon the training of teachers and even upon school budgets and building programmes. Furthermore, if readjustments take place as to the time allotted different subjects in the curriculum it is almost invariable that the increased importance given one subject must be at the expense of another.

Recently the question of the kind of education the schools should provide has become more acute by the insistent claims of science to a larger place in the curriculum. This has created uneasiness in certain quarters that the growing attention to science will destroy values long associated with the humanistic and philosophical traditions. It is our conviction that such educational conflict is unnecessary and unjustified. The end of education should not be the mere mastery of a body of knowledge - scientific, humanistic, or artistic - but rather the development of the "educated person". It is our belief that all categories of knowledge should be taught and studied as interdependent, each with its own contribution to the insights and understanding the educated person requires. Discoveries in natural science may affect profoundly the conditions of society in which the artist, poet, or sociologist carries on his work. We believe that traditional attitudes of separation and suspicion as between categories of knowledge should be eliminated and that all should find better relationships to a common goal.

VI

New educational devices which can contribute to the effectiveness of learning, whether originating inside or outside the formal school system, must aggressively be sought and utilised in the development of the content of the curriculum and in instruction.

As the numbers in school increase and as the content of education grows in complexity, traditional methods of education must be adjusted. To a considerable extent these changes are literally forced upon the school by the changing home and community environment which conditions pupils long before formal education begins. Children reared in cities, for example, (as most of them are coming to be) are literally surrounded by things which "educate" them - sounds and sights to which they are accustomed long before they have had them explained. Even if the schools themselves did not employ visual and other technical aids to learning, they would be compelled to accommodate their instruction to them because their pupils have been exposed to them in their homes and elsewhere. Children who have watched on television the launching of a rocket or have listened to international broadcasts face their teachers with different intellectual equipment from those whose experience has been more nearly limited to books alone.

The truth is that education is not nearly the monopoly of the schools or of teachers which it once was. In the marketplace, the flood of printed materials, books and magazines, the universality of moving pictures, television, broadcasting and travel, have brought about new and vivid educational exposure. As educational systems grow in magnitude, education as a market begins to attract commercial interests which bring their own resources and talents to its development. Publishers have joined with teachers in making books, charts, and pictures more attractive and effective. Makers of scientific equipment have simplified and improved instruments. The learning of reading, to cite a single example, has been profoundly affected by discoveries and techniques, many of which were developed outside the formal classroom.

The point we should like to stress is that the schools face not only the problem of teaching far more pupils than ever before, but of teaching them more than pupils have ever before been compelled to learn. The lengthening of the period of required education and of the school year will help, but the hope is to find better ways for more people to learn more in less time and to acquire the desire and ability to seek, find and use knowledge by themselves. It is important that contributions to the speed and effectiveness of learning, whether these are machines, new intellectual conceptions, or new forms of organisation, should be constantly sought and eagerly welcomed regardless of their source.

VII

Specific arrangements for co-operation between the teaching profession and the community should be established in all educational systems for experimentation and adjustments in curricula as well as in other spheres of educational organisation and development.

Bringing about curriculum changes in any educational system is by no means a purely intellectual problem. Forces which favour or oppose such changes are usually intense and powerful. Even if in theory it were possible to reach agreement as to what the schools ought to teach, there would still remain the problem of how to put such agreements into practice. It is our conviction, however, that ways must be found to incorporate in every educational system devices by which innovations can be made naturally and continuously if schools are to be modernised and kept up to date.

Since what the schools teach is in each country a product of many interests, traditions, and convictions, the process of change is by no means simple. The more education affects every phase of social life, the more will the schools, and especially what they teach and how they teach it, be the object of concern to teachers, to parents, to employees and employers, to government, to business and to every organised interest. This very complexity, however, gives the clue as to how change can be brought about, namely, through the co-operative effort of educational authorities and the members of the community.

In bringing about educational innovation, perhaps the heaviest responsibility falls upon the political educational authorities of a country. It is they who must make responsible judgements as to the adequacy or inadequacy of the schools for serving the country's general welfare, for developing the talents of its citizens, for providing its necessary technical competence, insuring its progress, and possibly, even its national defence. Suggestions for educational improvement may arise from political or other sources, but they can be put into effect only with the co-operation of the teachers and administrators in the schools and also with the general approval of the interested members of the community. In making innovations, the role of the teaching profession is crucial. If, for example, a country may feel the need, as many recently have, of expanded and improved instruction in science and technology, such changes can be brought about only if the support of the teachers can be enlisted.

We have already indicated that the development of school curricula will be different in each country, so intimately are they a part of the national life and culture. In the process of putting new school programmes into effect, the first step each country should take is to inaugurate a plan of inquiry and research. In such a review every level of educational operation must be considered and should participate - primary, secondary and university. It should enlist the efforts of the best minds in every field of study, for only through co-operation can desirable improvements be brought about.

VIII

The educational system of every Member country should carry on continuous research in learning - its processes, effectiveness and consequences - for the purpose of improving both the content of the curriculum and the quality of instruction.

Much has been said about the content of the curriculum and about the training of teachers. As aspects of educational improvement, the two are inseparable and will justify any amount of investment which may be made in them. We should also like to plead, however, for increased attention to the systematic study of learning. We know far too little about the processes of learning or about methods of increasing its efficiency. We know a child may "learn" what he does not "understand" - a poem or a mathematical formula. He may learn to "use" what he cannot "explain", he may learn what he is told, or he may find things out by self-discovery. Repetition may in one instance be the "soul of learning" and in another deaden all interests. No matter what we now know about learning, we need to know more.

Many of the important factors - and mysteries - of learning appear to be bound up with the concept of motivation. What factors stimulate effort and release energy ? Why on the other hand do many pupils of high ability do badly in school ? The curriculum itself is certainly an important factor. Students at all levels work harder and learn more quickly when they see a relationship between what they are studying and other aspects of their lives or aspirations.

We need to know more also about the influence of teaching methods and of equipment upon the efficiency of learning. The proficiency of reading, the value of visual aid, the techniques of discussion and discovery, the uses and abuses of drill, are all related to learning in ways we need to know more about. Even old questions such as teacher-pupil ratios need more investigation.

Improvement in the speed and quality of learning, with which we are here primarily concerned, is less the product of specific educational research than it is of the broader concept of educational development. Such educational development can result only from the collaboration of all those engaged in the educational process - the pupils themselves, teachers, parents and the community generally. Yet, this collaboration will be vague and ineffective unless it is given formal organisation, purpose and clear direction. As an important means of focusing this collective and organised attention upon the central problems of education we recommend the establishment of special research and development centres, both national and international, as sources of expert guidance.

It is the view of the writers of this report that improvement in education is a never-ending process, that each new advance becomes the foundation for the next. Probably the greatest barriers to improvement lie in our own habits and traditions and in our loyalties to what we ourselves have known. If we can see our past institutions and achievements as the best available to us at the time and move on to better ones as these become possible, we shall have done what we can to meet our responsibility toward the future.

Part Two

AN ANALYSIS OF PROBLEMS AND DEVELOPMENTS

This part of the report endeavours to provide the background information and analysis, based mostly on the experience of developments in Member countries, in substantiation and further elaboration of the basic concepts and considerations formulated in the preceding Part. The material is presented in three main sections. Section I describes the chief factors making for educational change ; Section II deals with those aspects and issues of curriculum improvement which are germane to the educational system and process, whereas Section III is concerned with the methods and mechanisms through which curriculum change is planned and implemented.

I

THE COMPELLING FORCES OF EDUCATIONAL CHANGE

The variety of factors which are cumulatively responsible for the profound changes in the world in which we live can be grouped under a few broad headings, viz : demographic, scientific, economic, social and political. They are considered here in terms of the demand which they make for a radical mutation of the form and content of education.

a) The pressure of numbers

Probably no basic fact is responsible for more social consequences than is the continued growth of population ; none receives more attention from the authorities responsible for educational planning. Within the gross rate of population increase the significant factor for education is the increase in the number of those in the school age group. To this must be added the larger proportion of the school age population which is now crowding into the schools as well as the larger proportion which is remaining in school for a longer period of time. This means that the impact of educational expansion cannot be appraised merely in terms of more facilities and more financial support ; it must also take account of changes in subject-matter and instruction required by a more variegated as well as a more numerous clientele.

The "educational explosion", which has not ceased to cause surprise and concern, is of relatively recent date. In the European countries as a whole enrolments in secondary education rose from 9,700,000 in 1950 to

13,900,000 in 1960, i.e. an increase of 43 per cent. In the Member countries of the former OEEC enrolments in the age-group 15-24 were expected to rise from 5,789,000 around 1958 to 11,203,000 in 1970, i.e. an increase of 94 per cent. In a general way, enrolments in secondary and higher education in the European OECD countries have doubled in the past 15-20 years and can be expected to double again before 1980. In nearly all countries this rate of increase has surpassed even the boldest forecasts. In France, for example, the 1962/63 enrolments in higher education were 14 per cent higher than had been foreseen a few years earlier ; the figure foreseen for 1970, which had until recently been considered extravagant, will be attained by 1966-67. The following table concerning the development of forecasts of enrolments in higher education in the Netherlands provides another example of the need for a regular revision of enrolment forecasts (1).

Year in which forecast was made	Actual enrolment in base year	Predicted enrolment in 1970
1950	29,000	50,000
1955	29,000	56,000
1959	35,000	65,000
1963	52,000	80,000
1965	65,000	95,000

That these increases are not solely, or even mainly, due to population growth can be seen from the enrolment ratios. In the OEEC area the increase in population in the age-group 5-24 had been estimated at only 10 per cent between 1958 and 1970, whereas the present annual enrolment increases in secondary as well as higher education are well over 5 per cent. In a large number of countries enrolment ratios have more than doubled since the war and may be expected to do so again within the next fifteen years. A still greater expansion may be expected if only the present ratios in the most developed Member countries were to be attained in the OECD area as a whole. For the 15-19 year age-group, these ratios varied, around 1960, from 69.5 per cent in the U.S.A. to 49.3 per cent in France, 29.9 per cent in the Netherlands and 12.7 per cent in Portugal. It would be realistic to foresee for a not too distant future an almost 100 per cent enrolment ratio for the total age-group 6-18 in the OECD area, an eventuality which shows up the staggering dimensions of the problem.

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(1) Data from "Educational Planning in the Netherlands", a contribution from the Netherlands to the OECD Programme on Educational Investment and Planning, OECD, March 1966, p. 48.

The challenge which this expansion throws out to educational planners and authorities is not merely one of providing facilities to accommodate greater numbers, however important this may be. It is rather one of adjusting the education the schools provide to reflect, in its content and method, the full spectrum of the needs, interests and abilities of the entire community.

b) The expansion of knowledge

The rapid increase in the volume and complexity of knowledge represents perhaps the most dramatic of all the forces in the world of today which are acting upon educational development in the schools. One scarcely needs specific illustrations of the revolution such knowledge is creating in the life of every country, with corresponding pressure upon educational systems. This expansion of knowledge appears more spectacularly in mathematics, the natural sciences and technology than in the human sciences, but it is scarcely less so in areas of social life and organisation.

A major cause of this leap forward is the deliberate inclusion of research as a new factor in our intellectual and social operation. The advancement of knowledge in its own right, and of its application, by means of systematic effort and of special tools of investigation, has created exciting new interests and attitudes and has in fact become the object of one of the biggest investment enterprises in modern society. It has, for one thing, led to profound changes in the organisation of professional and social life. It has given rise to a proliferation of specialisations within fields already highly specialised and is posing difficult problems of assimilation and organisation of information.

Its impact on the educational system and process has been no less profound. School curricula must reflect the most up-to-date knowledge in any particular subject. This calls for continuous revision of courses and text-books and the retraining of teachers to take account both of the increase in the amount of knowledge and the rapid change in its nature. The searching scrutiny which is now being directed towards mathematics and natural science curricula is a good example of what should and could be done in this direction. At the same time there is a limit to the amount of material which can be accommodated within the school syllabus, and the extension of schooling which has resulted from the awareness that man in modern society needs more basic knowledge and preparation, cannot in itself resolve this problem. This dilemma has reinforced the concept that the role of the school is not to proffer even more knowledge but to select from the vast stock of knowledge that which is essential and, particularly, to develop the aptitude for acquiring and using knowledge on a continuing basis. This implies the cultivation of the right attitudes of mind in pupils and teachers so that they may be receptive to new developments in knowledge and to their incorporation into the regular process of education itself. It is only in this way that teaching can become an instrument not only for the dissemination of knowledge but also, especially at higher levels, for its production.

c) The expanding role of education in socio-economic life

The recognition of the growing interdependence between education and the "outside world" is a major feature of the educational history of our times. Modern society rests upon a level of competence which is supplied through education ; at the same time no school system can supply the required level of skills and competence without the active support of society. Investment in education has therefore become one of the vital elements in the increase of general welfare, while the shape and character of education are more than ever determined by socio-economic conditions and considerations. This view reverts at once to the main theme of this report, namely the kind of education the schools should supply and its constant renewal and development by reference to changes not only in knowledge but in the needs of the society as well.

The necessity for cultivation in the schools of a sense of relevance of what they teach to the life of the community implies that the diversity in the characteristics of the OECD Member countries must naturally be reflected in the detailed organisation and operation of their respective educational systems. Yet, amid these differences, the levelling process of growing industrialisation, increased communication and expanding trade are reducing old-time contrasts between communities to a common pattern which gives increased universal validity to the basic concepts and objectives of education.

The interdependence between school and society reveals also other, less obvious and often not clearly recognised, aspects : the community, with its daily pre-occupations, its newspapers, television, radio and public services, becomes a kind of informal and all-permeating educational system giving reality to the more abstract approach of the classroom. Our society is an "educative society" in the sense that education has become ubiquitous and accompanies children and adults in, as well as outside, the school. The borderlines between formal and informal education tend to become less and less distinct, the intrusion of everyday life in the school community and in what and how the schools teach, more and more apparent. Future education will need to appreciate this interaction and to adapt its objectives and methods to it, instead of considering it as interference in its work.

d) Scientific and technological change and the need for educational and social adjustment

The speed with which science and technology are transforming the conditions of modern life has, as a theme, become wearisome ; as a fact, it is a never-ending source of surprise and wonder.

The key to the mastery of the world as it is now and, much more so, of the very different world in which we shall live in one or two decades from now, is adaptation. Because of the speed of change, educational and social adjustment needs to be made more rapidly ; the lapse of time between discovery and innovation, between research and its incorporation into practice, will have to be reduced.

In education, change is notoriously slow in getting accepted. Complete diffusion of successful "innovations" in the field of education appears to take approximately fifty years after the first "authentic introduction" (1). It has been estimated that approximately fifteen years elapse before 3 per cent of the schools adopt the innovations. The rate has, however, in recent times grown considerably faster. This acceleration can be observed not only in the introduction of primarily technological innovations, but also in organisational changes and in curriculum materials. A good example of this is the case of the Physical Sciences Study Committee : the first text was available in 1957 and already in 1961 20 per cent of all U.S. secondary schools were using the material. In fact, in the natural sciences, where the cleavage between what is taught in the schools and the state of advancement of the science in question has been particularly impressive, as a result of serious efforts in the past decade both in the United States and in several European countries, the gap has been considerably reduced.

Major problems in the planning and execution of such curriculum reform projects appeared to be the absence of appropriate mechanisms for initiating changes (about which more will be said later) and the need to develop attitudes of mind towards making innovations more acceptable. In both fields the activities sponsored by OECD in the adaptation of science and mathematics curricula have in many Member countries provided an effective demonstration of the way in which change can come about, both at the pedagogical and policy levels. By no means the least achievement of these activities has been the inculcation of favourable attitudes to change in teachers and administrators, the importance of which will be appreciated by all those who are aware of the force of tradition and the reluctance to change which have characterised education for centuries. It is largely as a consequence of this change in attitude towards knowledge and education that educators in several OECD Member countries have been encouraged to think of educational changes not in terms of periodic revisions but as a continuous process, a "rolling" adjustment.

Scientific and technological changes have consequences not only for the content of what is taught, but also for the attitudes and habits which education should develop. Life in a technical world requires rapid adjustment, it involves many superficial contacts, it calls for quick decisions. Modern communication has made man "other directed" ; he depends more than ever on the technical achievements which surround him, his opinion is influenced and even largely determined from the outside. It is the task of education to help him live in this world, to find his way and form the habits and attitudes which enable him to master situations under which he would otherwise be constantly overwhelmed and over-taxed.

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(1) See Mathew B. Miles (ed.) : "Innovation in Education", Bureau of Publications, Teachers College, Columbia University, New York, 1964 p. 5 ff.

Education has long ignored and even rejected the technological society which is developing in the industrialised countries. It has persisted in preparing children for a world viewed from an inherited, traditionally cultural, outlook. It is only comparatively recently that the need for a positive attitude towards modern society has been recognised by educators and constructive ideas have been developed as to the adaptation of the school curricula to prepare the pupils for their role in the world of tomorrow.

e) Social demand for education

The rising demand for education has become one of the most important factors in modern educational policy. The right of the individual to be offered the opportunity to develop fully his abilities has been generally recognised. The most obvious result of this recognition has been the prolongation of the period of compulsory schooling.

However, there is still a long way to go before equal educational opportunities can be effectively achieved. Statistical data continue to show great discrepancies in the participation of the several social strata in the various types of education ; these discrepancies cannot possibly be attributed to differences in abilities and there is evidence to show that in most countries increased educational opportunities are benefiting in the first place the already privileged middle and upper class (1). Recent research shows that, for example, in France, the son of a higher employee has 80 times more chance to go to university than the son of an agricultural worker and 40 times more than the son of an industrial worker (2).

It is being increasingly recognised in many countries that providing equal educational opportunities is not the equivalent of merely removing formal obstacles. The impact of socio-cultural and regional factors has proved strong enough to largely invalidate the effects of the improvement of formal educational opportunities. In spite of enormous increases in enrolment ratios, the inadequate representation of the lower social strata in general secondary and higher education has remained practically unchanged.

This has led to increasing attention to the socio-cultural bias of existing curricula, methods of teaching and devices of selection and examination as important aspects of educational policy. It is now beginning to be accepted that an active talent promotions policy, involving a revision of existing curricula, teaching methods and evaluation devices, and a system of special programmes for the socio-culturally disadvantaged children, is necessary to attain an equitable situation with regard to educational opportunities. In the most recent past, special programmes for these groups have been concentrated on elementary and pre-school age children, as more and more evidence shows that the socio-cultural background affects children's performance already at the pre-school level. In particular, in the U.S.A. "cultural enrichment" programmes have been undertaken, first at the high school level, but more recently also at the elementary and pre-elementary level.

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(1) On this point see, especially, "Ability and Educational Opportunity", OECD, 1961.

(2) See Pierre Bourdieu and Jean-Claude Passeron : "Les Héritiers : les étudiants et la culture". Ed. de Minuit, Paris, 1964, Table I, p. 15.

In a general way, recent educational legislation in several OECD Member countries clearly recognises that the concept of full educational opportunities directly implies an adaptation of the school structure, of methods of teaching, of curricula and of methods of selection and evaluation. In fact the reform of the education for the age-group 10/11 to 14/15 is to a great extent guided by this objective.

The close interaction between better educational opportunities and the social demand for education can be seen from the practical experience of several OECD Member countries where the offer of better educational opportunities often created a much greater demand for education than had been foreseen and necessitated further reforms. Examples can be quoted from the experience of France, Sweden and Yugoslavia. The fact, in particular, that the demand for those programmes which lead to higher education tends to be higher than was anticipated, or may be deemed desirable, compels educational policy-makers to revise their plans, and increases the need for a flexible school structure and a curriculum which offers preparation for all types of further study as well as for professional activities.

II

EDUCATIONAL ASPECTS OF CURRICULUM IMPROVEMENT

A. The developement and present status of the curriculum

The previous analysis of the forces compelling educational change makes possible a comparison between conceptions which have shaped curricula in the past and those which are shaping them now. In effect, this amounts to a comparison between the societies of the past and those of the present, for in every period the pre-occupations of education are related to the prevailing values, concepts and ways of life.

a) Basic intellectual considerations

Only a few generations ago, formal education was the privilege of a limited number. The language of instruction was predominantly Latin and the substance of education was largely dominated by languages, literature and moral philosophy - a heritage which in many countries is regarded today not merely as a major part but the most esteemed part of scholarship. It was only comparatively recently that the mother tongue in most European countries replaced Latin, and that instruction in science and formal history was included in the curriculum. Moreover, religion was, in most countries, a more direct and influential force in the operation of the schools and in the determination of what was taught. Education was dominated by the general theory that knowledge was "encyclopaedic" in nature, that it accumulated with the passage of time and, hence, that scholarship was largely a process of mastering a universal body of essentially static and factual knowledge. The expansion of knowledge was accomplished largely as a process of deduction, that is, a process of deriving new knowledge from the logical spinning-out and refinement of hypotheses and "propositions". The revolutionary inductive method of intellectual enquiry took a long time to establish itself as the basis for the modern approach to research and learning.

In contrast with these historical characteristics of education and under the pressure of social, economic and technological changes, described above as compelling forces, there have been marked alterations not only in the specific content of curricula but in the basic conceptions of education and knowledge itself. Some of these fundamental changes may be briefly noted.

Perhaps the first is the gradual shift from the conception of knowledge as an exploration of a relatively fixed encyclopaedia of universal knowledge, as the stock-in-trade of education, to the conception that knowledge is limitless and capable of indefinite expansion. This belief that everything is "knowable", and that it is within our province to explore it, is a basic philosophic assumption of modern thought. It has profound implications for both the substance and the methods of education. In terms of substance it opens up every field for study and research. In terms of educational method it diverts a large amount of our attention from the mere accumulation of facts and information to be committed to memory, to the search for purpose and principles around which knowledge may be organised. Specialisation has given rise to an urgent search for generalisation. Translation of this principle in practice now affects every phase of educational operations.

The second fundamental change is that education as a whole has come to have much greater concern with its role of social utility than was previously true ; this implies a much greater appreciation of the use of education not only as a force in social and economic life but as a means by which to develop the capacities and competences of all individuals. While the great growth in social studies themselves is perhaps the most spectacular evidence of this new interest, it is to be found as an accepted part of the subject-matter and instruction in every field, however old and well-established. In short, there has been a basic enlargement of the conception of education to include not only the expansion and dissemination of knowledge but consideration for its effects on individual and social welfare. This fact has transformed education as an activity, the effects of which were essentially socially restrictive, that is to limited numbers and the support of established institutions, into an instrument of social service from which an entire society may profit.

A third basic change of educational conception has profound implications for the development of curricula. This may be called the increasing orientation of present day education toward the future rather than the past. This reorientation is a consequence of many things. The vast expansion of knowledge and the rapidity with which it becomes obsolete reduces the applicability of many of the "facts" of past knowledge to present problems, even in such diverse areas as diplomacy or natural science. Furthermore, technology, which cannot be sustained without education, has become the means for creating a new world. As a result, education itself is, in fact, becoming an instrument of power for bringing about social, political and economic changes, while still conserving all its traditional characteristics as a means for developing and transmitting the culture of the past.

The gradual infusion of these basic conceptions into education, whether they are cause or effect, can be seen as a practical matter in almost every phase of education, from the organisation of the schools, to methods of instruction and the content of the curriculum. Among the earliest consequences was the development of the professional training of teachers in the early part of the 19th century, set up in part as a response to the establishment of a new type of general secondary school as an off-set to those dominated by the regular classical programme. The expansion of the curriculum was another consequence, with more mathematics, science and modern foreign languages finding their way into the curriculum. More systematic attention began to be given to the development of textbooks. All of these developments, slow in the beginning, have accelerated with a speed which now makes the crowding of the curriculum, the selection of subjects and the organisation of knowledge major problems of education.

Many of these problems reveal themselves specifically in the evolution and adaptation of curricula in the Member countries of OECD today. They are reflected in the variety of subjects taught and in the varying allocation of time devoted to their study. These variations are significant in both primary and secondary schools.

b) The elementary school curriculum

Where a greater number of subjects is offered in the curriculum of elementary schools, there is largely general agreement as to what subjects should be included but there are substantial differences in views as to the amount of time which should be given to each. Thus the core of instruction at elementary levels remains as it has always been, a study of reading, writing and arithmetic, but there has now been added some instruction in varying forms and degrees in elementary science, history, geography, the operations of society, concern with health and physical education, creative aptitudes in music, art and handicrafts and, possibly, the introduction of a foreign language. This of course represents a considerable expansion of elementary education in contrast to its content even a generation or two ago but the apparent breadth and depth of interest enumerated here should not be taken too literally. In many schools, and in many countries, some subjects and areas receive only token attention and in many they are not included at all. It is only when one adds to the description of the broadening of the primary school curriculum the analysis of the time devoted to these subjects, that it is possible to get a truer measure of educational effectiveness.

Important variations can already be observed in the length of the school year in the individual OECD countries. In Japan, for example, it is longer by as much as six weeks than in several European OECD countries (1).

More striking are the differences in the total number of hours per week devoted to the individual subjects and the time available for each subject in the total primary school curriculum (2). The matter is of greater importance than it may seem at first sight : a foreign language may, for example, be included in the curriculum but if its study is not given sufficient time to achieve a fair degree of mastery, the time will have been largely wasted as language study and will have been diverted from other subjects where it might have been more profitably spent. With regard to science education at the elementary level the same observation can be made. Of course the educational implications of such time-measures must be read with other factors in mind as to how these hours are spent within the school and as to the relationships between the school and the home. Thus, the shorter school-day may mean a larger proportion of homework. The question of whether the larger or smaller proportion of "school hours" provides the best learning environment deserves continued study. Nevertheless, we must conclude that the number of hours per week spent in school bears significant relation to the total educational achievement.

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(1) See for information on primary and secondary school curricula : "Primary and Secondary Education : Modern Trends and Common Problems", by Jean Thomas and Joseph Majault, in series "Education in Europe", Council of Europe, Strasbourg, 1963 ; "Education in Japan. A Graphic Presentation", Ministry of Education, Tokyo, 1964 ; "The Elementary School in Yugoslavia", Ed. Jugoslavija, Beograd ; Fifth Conference of European Ministers of Education, Report prepared by the Secretariat, Vienna, October, 1965.

(2) In the first year of elementary education the total number of hours per week varies from a low 18 (Germany, Austria, Norway) to a high 30 (Spain, Luxemburg). In the final year the variations are between 23 (United Kingdom) and 35 (Sweden). Equally large variations can be observed in the weekly time devoted to the individual subjects. In the final year of primary school, e.g., the number of hours available for teaching of the mother tongue varies from 5 to 10 hours per week ; for arithmetic, from 4 - 6,5 hours ; for science, 0 - 4 ; foreign languages, 0 - 5 (in the majority of Member countries no foreign language is taught in primary schools).

c) The secondary school curriculum

If the evaluation of the primary school curriculum shows such wide variations in response to modern pressures, the curricula of the secondary schools are even more revealing in their variations and the educational results are even less comparable. The number and variety of subjects taught in the secondary schools are greater than in primary schools, and accordingly there are greater differences in the time devoted to them. It is this multiplicity of subjects and the differing purposes for which they are studied which creates much of the organisational complexity of secondary education. Vocational interests and higher education, as well as the growing interest in general secondary education, create the various "streams" or branches at the secondary education level. The curriculum and time-tables of general secondary schools become more and more complicated as the choices open to students become more numerous. In educational systems such as those in the U.S.A. and to a lesser extent the United Kingdom, as well as in some which are now being re-structured, as, for example, Sweden, the time-table of upper secondary schools has become a highly complex scheme of work, the planning of which requires great organisational skill and puts a heavy burden on the teaching staff.

The distribution of the various subjects in the time-tables of general secondary schools in OECD countries are presented in Table 1. This shows that in the humanities sections nearly half of the total time is devoted to languages (with exceptionally low percentages in Turkey and Yugoslavia) and in general less than a quarter to science and mathematics. In the science-mathematics programmes these percentages vary also very significantly. It is clear that in general a higher number of hours for the study of languages leads to a correspondingly lower number for science and mathematics.

The differences in the amount of time devoted to what may be called the "human sciences" are also striking, from 7.2 per cent of the total time per week to 21.7 per cent. In a large number of countries the differences between the literary and science programmes of the schools are so far as these subjects are concerned very small. The "human sciences" are apparently considered as part of the general knowledge which all students should acquire. The same is true of the study of the mother tongue and in some countries of aesthetic and art education.

As to modern languages their place in both science and literary programmes in a number of countries is a very modest one (for example, Greece and Spain) but in others the exact opposite prevails (Norway, Iceland and Ireland). In certain countries students in science programmes

Table 1

Percentage of total time devoted to subjects in general secondary education (humanities and science sections) (1)

Country	Section	Mother tongue	Classic languages	Modern languages	Total languages	Maths	Sciences	Total maths science	Human sciences	Arts (2)	Other subjects (3)
Austria	Class.	11,7	20,3	5,5	37,5	9,8	13,6	23,4	13,8	10,6	14,6
	Science	11,7	-	14,8	25,5	17,1	15,1	32,2	13,6	12,9	14,6
Belgium	Latin/Greek	14,4	22,1	15,3	51,8	11,1	7,1	18,2	9,6	6,8	13,5
	Mod/Maths	14,9	-	19,4	34,3	17,9	8,5	26,4	11,0	12,0	16,5
Denmark	Class.	13,0	18,2	19,3	50,6	10,2	6,8	17,0	12,5	6,8	13,0
	Scient.	13,0	0,0	19,3	32,4	16,4	17,0	33,5	13,0	7,9	13,0
France	Class. A.	13,9	21,0	11,5	46,4	9,7	8,2	17,9	19,5	8,0	8,3
	Mod/Maths	17,3	-	22,4	39,7	16,4	13,0	29,4	15,3	7,7	7,9
Fed. Germany	Class.	13,1	27,5	6,0	46,6	9,4	9,1	18,5	11,7	10,8	12,4
	Scient.	13,5	8,4	15,8	37,7	12,8	13,4	26,2	11,7	11,8	12,4
Greece	Class.	8,5	29,5	8,0	46,0	10,3	9,4	20,3	14,2	6,1	14,1
	Scient.	8,7	18,4	7,8	34,9	16,5	13,1	29,6	11,6	11,2	12,6
Iceland	Class.	13,4	7,1	29,1	49,6	11,8	19,2	31,0	9,9	9,2	9,5
	Maths/Sc.	13,5	1,6	23,6	38,7	15,9	19,2	35,1	9,6	9,2	9,6
Ireland	Class.	11,4	8,4	22,2	42,0	15,0	10,6	25,6	12,9	8,5	11,0
	Scient.	10,4	8,4	21,7	40,5	19,6	16,1	35,7	7,2	5,6	11,0
Italy	Class.	15,8	28,0	5,8	49,6	7,9	10,1	18,0	21,7	-	10,8
	Scient.	12,7	14,4	12,2	39,3	12,9	13,0	25,9	15,8	7,2	10,8
Luxembourg	Class.	18,2	29,9	9,8	57,9	9,8	7,0	16,8	9,4	4,2	11,6
	Modern	19,2	-	22,1	41,3	17,6	10,4	28,0	9,4	9,6	11,7
Netherlands	Lit.	9,1	33,3	18,2	60,6	8,6	6,5	15,1	14,1	2,5	7,6
	Science	10,9	-	23,7	34,6	17,5	18,2	35,7	15,2	6,6	7,9
Norway	Languages	13,9	-	35,6	49,5	10,6	8,3	18,9	11,7	7,2	12,7
	Science	13,9	-	23,4	37,3	16,7	13,9	30,6	12,2	7,2	12,7
Spain	Literature	10,6	17,6	9,7	37,9	6,9	12,1	19,0	16,2	4,2	28,7
	Science	10,6	4,2	9,7	24,5	13,9	18,6	32,5	16,2	4,2	28,7
Switzerland (Bern)	Class.	10,0	33,9	10,0	53,9	12,0	6,0	18,0	12,1	6,4	9,6
	Scient.	14,7	-	21,2	35,9	21,5	12,8	34,3	11,5	8,8	9,5
Turkey	Literature	15,7	-	12,5	28,2	13,0	17,8	30,8	19,8	9,5	12,0
	Science	13,5	-	11,5	25,0	16,7	21,3	38,0	15,6	9,5	12,0
United Kingdom	Literature	18,0	10,0	15,0	43,0	10,00	8,0	18,0	18,0	12,0	19,0
	Sciences	12,0	-	10,0	22,0	22,0	24,0	46,0	10,0	13,0	13,3
Yugoslavia	Lang/Soc. St.	12,9	3,2	12,9	29,0	8,9	18,5	27,4	20,2	4,9	19,5
	Sciences/Math.	10,5	3,2	8,9	22,6	13,7	31,5	45,2	12,1	2,4	17,7

1. Most data from the Report prepared by the Secretariat to the Fifth Conference of European Ministers of Education, Vienna, Octobre 1965, Table 14. 2. Including "practical arts" and "aesthetic education". 3. Including "physical education", "religious" and "miscellaneous".

receive very little training in modern languages whereas the students in literary programmes spend a considerable amount of time on these subjects (Germany, Austria, Luxembourg and Italy).

From this brief review it would appear that there is no uniform concept among OECD countries as to the role of various subject groups in the general secondary school. Some of these differences can be explained in terms of particular situations or conditions prevailing in different countries. On the whole smaller countries tend to spend more time on modern foreign languages than do countries belonging to larger language areas (e.g. the Netherlands, Norway and Denmark). Such logical arguments explain however only a very small portion of the differences in the allocation of time to the various subjects in the curricula of the countries. It is apparent that in very many cases this allocation is less a matter of logical planning than of tradition, prestige and pressure from various social and political groups. School curricula seem more than any other aspect of education to be the residue of the countries' social and political history. It is one of the most striking characteristics of the recent educational history of the OECD countries that the past few decades have witnessed a more thorough adaptation of the school curricula to contemporary needs than had been the case over the past few centuries.

d) The changing objectives of the curriculum

Dominating all the changes which have already been mentioned and others which will be mentioned later in this report is the transformation in the general objectives of school curricula : they are no longer simply programmes which enable children to be admitted into higher education or to pass examinations. Curricula now include, as part of their objective, the basic preparation of all children for their training as citizens in a contemporary society and the development of their individual aptitudes and interests in order that they may later play the role which suits them best. Such a curriculum is necessarily a general curriculum for all children ; it offers differentiation only where and as soon as this is justified by individual abilities and interests.

Thus the curriculum is much more than a time-table and a description of subject matter to be taught. It lays down the principal objectives of teaching, the attitudes which should be developed in pupils toward learning, the skills which education should promote, the methods of teaching to be used and the organisation of teaching. In other words the whole complex of educational objectives and of the ways and techniques by which they are achieved must be involved.

The consequences of this evolution are shown most clearly in the school period following the completion of elementary education and preceding more specialised secondary schooling, i.e. lower secondary education. The structural changes which have come about at this level to provide for the needs of workers in the modern labour market aim at a broader general background. This has required the introduction of new subjects and new approaches. It involves a new modern humanities curriculum in which science and technology occupy their rightful place and in which, parallel to more technical aspects, social, aesthetic and ethical qualities are developed (1).

The impact of this approach is also beginning to be felt at the next level, upper secondary, where, however, many of the curriculum adjustments which have been made in the recent past-the selection of subjects, the allocation of the time to be given to them, and the actual materials to be taught- have too often been determined without any clear thought or consideration as to the general objectives of the curriculum within the wider spectrum of educational development. It is significant that in countries, e.g. Sweden and Yugoslavia, where the system of secondary education has been thoroughly and systematically reconstructed, this piece-meal approach is explicitly deprecated and curriculum development is regarded as an integrated item, part and parcel of educational planning and policy. This trend, if at all generalised, represents a major challenge to those responsible for educational development.

e) The school in the world of tomorrow

Educational change will of course continue. Two factors alone would be sufficient to ensure this : the first is the growing expansion of educational activities and the dependence of modern society upon them ; the second is the pervasive spirit of experiment in areas which directly or indirectly affect education. The complexity of educational processes and of the factors which affect them is a matter of growing appreciation. Speed and rapidity in learning is a field still producing a steady stream of surprises and improvements. Teaching machines and other mechanical devices and aids are now an accepted part of learning techniques, and there are experiments even in the realm of medicine which are hinting at new possibilities. New responsibilities such as those created by the armed services and in space exploration have resulted in the necessity for finding new ways of learning.

No one can forecast with accuracy the form of the world in which people may be living in the year 2000. If, however, we assume that certain trends will continue, it is possible to predict at least something as to the state of education. For example, it is probable that in the OECD area virtually the entire population between 4 and 20 years of age in most countries will be in full-time education. This means, taking into account the increased size of the respective age-group, at least a three-fold increase in present enrolments. It means in fact that education will become the most important of national activities involving by all odds the largest expenditure of national budgets. It means that full-time formal education will be but a part of a general process of life-long training and that the latter will in terms of size, organisation and budget assume an importance at least equal to that now involved in the regular school system. The function of the schools will be profoundly affected by the impact of outside sources of information ; in fact the schools will have a different task in teaching children to sort out the abundant flow of information and to teach them how to use it rather than be overwhelmed by it. Probably much of the teacher's task will consist in organising his work to take full account of additional techniques and facilities, and for such work teachers will have to receive special training and preparation.

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(1) For example, technical education as part of general education has been introduced in the new types of schooling for the age-group 10/11 to 14/15 in Belgium and Yugoslavia. Science education has obtained a greater number of hours per week in all the countries which reformed their educational systems at this level.

All of this means that education should itself take the initiative in anticipating these developments and in preparing organisations and techniques with which to deal with them.

B. Problems of curriculum adjustment

The trends and developments outlined in the previous section are the subject of considerable thought and discussion in the Member countries from which the basic concepts of a curriculum development policy are gradually emerging. This new "prise de conscience" centres around the notion of the curriculum as a complex entity, the adequate functioning of which depends on the integrated action of all its parts. It would be useful, therefore, to attempt a brief examination of the main problems with which curriculum adjustment has had to deal in the recent past and of the prospects for their solution arising from current discussions and controversies.

1. The general problem of integration and balance

The introduction of new subjects in school programmes and the re-allocation of time by subject are the most tangible signs of changes in the content of teaching. They represent also the most sensitive aspect of the problem not infrequently giving rise to sharp controversies between the protagonists of particular subjects pressing their conflicting claims for a bigger "slice of the school cake". In fact, in many cases of curriculum reform, the question of the number of hours to be devoted to individual subjects or subject-groups appeared as the essence of the matter. In the course of these disputes, however, it was also often realised that more essential values were at stake. The discussions, for example, around the place of humanities and of scientific subjects and that concerning the weight to be given to general education as opposed to technical training led to focussing attention on larger subject-groups, with their complementary functions and characteristics, as the core of the problem.

The humanities/science controversy has been, understandably, the most notorious. The augmented place which science and mathematics have come to occupy in school programmes has largely been achieved at the expense of the humanities and, in particular, of classical languages, and this has led to strong reactions on the part of the protagonists of these disciplines. In several OECD countries the discussion around the place of Latin and Greek in general secondary education has been one of the key issues of recent school reforms. In the heat of discussion it was often overlooked that the retention of the classical languages in the changing general secondary school implied that henceforth these subjects had to be taught to all children of the age-group, instead of a minority, as was the case under the former selective school system.

Part of the uneasiness among the protagonists of the humanities arose from the fact that whereas seemingly unlimited resources have in the past few decades been made available for science curriculum reform, hardly any effort was made to deal with the humanities in a similar way. There has, however, in the recent past, been a significant shift in the opposite direction and research in social science and languages curricula is beginning to acquire respectability and to share part of the funds. In the case of the U.S.A., for example, whereas as late as 1964 only a very few embryonic curriculum projects in these fields existed, by the end of 1965 more than sixty research projects to improve the teaching of arts and humanities had been launched in the framework of the 1964 National Arts and Cultural Development Act (1).

The general education/technical training issue has also been the subject of much discussion and controversy. The position of vocational training was not always successfully re-defined after the prolongation of the period of general education. Its very existence seemed threatened because of, on the one hand, the increased part of general education in vocational training courses, and on the other, the trend to extend the courses by one or more years, to a point where their existence parallel to technical training courses of the same kind seemed less and less justified. Secondary technical training, in its turn, has become more and more oriented towards both professional employment and higher education and great difficulties have been encountered in adapting its programme to this double role. In ridding vocational and technical education of their isolation and in inserting technical education in the mainstream of general education, political and socio-cultural arguments played an important part. The development went in many cases counter to the short-term interests of industry and commerce, in particular those branches which had not adjusted their working methods to the standards of an industrial age. Another important element in this discussion was the increasing tendency to separate training in skills from the formal processes of education, leaving it to post-school training facilities to meet this need. As in many cases the required training facilities in industry were insufficiently developed, it is not surprising that this evolution of education has, in many OECD countries, met with initial distrust on the part of important industrial and commercial branches. Yet, it is now being realised that the extension of the period of general education has been fully justified by the increasing demand for a solid background of general education for professional workers, who, because of the rapid evolution of methods and techniques of production, have to be prepared for continuous training and re-training.

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(1) See "The First Work of These Times", U.S. Office of Education, U.S. Department of Health, Education and Welfare, Washington, D.C., p. 62.

Both controversies have by now lost most of their sharpness as a result of a better awareness of the real issues at stake which are reflected in the transformation in the general objectives of school curricula as described in the preceding chapter. If the ultimate objective of education is to develop to the full the potentialities of the individual, this is seen much less as a question of subject-matter taught than of the aptness of teaching to develop in pupils a critical attitude and the ability to identify the essence of a problem and contribute to its solution by applying the right methods and techniques. "Humanism" thus has a much fuller connotation than its classical concept and can be developed through science as well as through the humanities.

Discussion around the problems mentioned above has in fact greatly contributed to helping the school place its frames of reference outside its own narrow world of subject-requirements, standards and examinations. From "subject-centred", education has become "society-centred" and "pupil-centred". This process has been facilitated by the breaking down of the traditional and somewhat artificial boundaries between the various disciplines at school level. This applies not only to the sciences, but also to such subjects as history, geography and civics teaching, with the introduction of "social subjects" taking care of the group as a whole, at least in the initial phase of teaching. In such larger subject-groups a broader field of knowledge and a larger segment of culture can be treated, thus laying the foundations for the subsequent individual disciplines.

The curriculum of the primary schools in Yugoslavia, for example, provides for grades I - III a broad subject under "nature and social study". In grades IV - VI this splits into two fields : "nature study" and "social study" which, in their turn, as from grade VII onwards, split into physics, chemistry and biology, and geography, history and "moral education" respectively (1).

In Sweden the comprehensive school curriculum, as it is valid at present, provides for "social studies" in grades I - III. As from grade IV, social studies, civics, history, geography and nature study appear separately, whereas biology, chemistry and physics appear in the curriculum as from grade VII where the broader subjects "social studies" and "nature studies" disappear as separate disciplines (2). In the new regulations concerning the gymnasia the need for co-ordination beyond subject-frontiers is particularly emphasised. The discussion around the new gymnasium curriculum has, in its turn, affected the thinking about the subject-division in grades VII - IX of the comprehensive school. There is now a strong trend in favour of abolishing the division of the broader subject-groups in these grades into individual disciplines and maintaining the broader categories "nature studies" and "social studies" throughout the 9-year programme.

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(1) "The Elementary School in Yugoslavia," op. cit. p. 31.

(2) See Jonas Orring, "Comprehensive School and Continuation Schools in Sweden", Stockholm, p. 70-71.

A further example of this trend is the introduction of "general science" in the curricula of junior secondary education in several OECD countries. This is explicitly intended to be a general preparation before the pupils embark on biology, physics and chemistry as separate disciplines.

These matters have an important bearing on the problem of the overall "balance" within the school curricula. Such "balance" has substantive as well as functional attributes which are inextricably linked together in their interaction on the system as a whole. It refers, in the first place, to the distribution of the number of hours per subject or group of subjects in the time-table ; secondly, to the types of programmes that are available at each level, i.e. to the problem of differentiation ; thirdly, to the organisation and distribution of the several types of school activity, e.g. class-teaching, individual work, group-work, etc ; and finally, to the selection and relative emphasis of specific items or topics within each subject.

In this sense "balance" is inseparable from the problem of "co-ordination" within the curriculum, which is made necessary because of the division of knowledge in a great number of subject-fields. Co-ordination, as discussed above , recognises these boundaries but aims at minimising their stultifying influence. More ambitious attempts to bring the problems nearer to an "ideal" solution have been tried out in the recent history of education, in the form of "project-courses", "team-teaching", "inter-disciplinary approach" and under many other, not always clearly defined, designations. They all represent an attempt to break down the boundaries between subjects and to base teaching on problem-areas studied from the angle of the various disciplines. The "Trump System" (1) uses several of these approaches and advocates an entire re-organisation of teaching and learning. Such attempts, however, face great organisational problems, the most important of which are schools' time-tables, which divide the day into periods too short for the comprehensive treatment of a problem and, secondly, the fact that above a certain level teaching is entrusted to specialised subject-teachers.

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(1) The "Trump System" is based on the ideas about innovation in education which have been developed by Dr. J. Lloyd Trump, Associate Secretary of the National Association of Secondary School Principals in Washington, D.C. Dr. Trump recommends a number of sometimes radical changes in present school practices, touching in particular upon the curriculum content, the size of pupil groups, time schedules, the use of educational facilities, evaluation techniques and the re-education and the role of teachers. His main argument is that these changes should be undertaken as parts of a co-ordinated programme related to each other in an instructional system. Vide : J. Lloyd Trump and Dorsey Baynham : "Focus on Change - Guide to Better Schools", Rand McNally Company, Chicago, 1961.

Interdisciplinary problems have in many countries received much attention. Study groups of teachers of related subject-groups have attempted to co-ordinate the teaching of the various subjects and the successive order in which they should be taught, and to define the areas of common interest to which attention should be given in each of the separate fields. This interdisciplinary contact has proved very fruitful in facilitating day-to-day co-operation between teachers of related subjects. Such form of co-operation, however, has been rare at another level where it is at least as necessary, i.e. among those who set and develop the curricula, in national, regional or local administration. The function of interdisciplinary teams at this level should be to co-ordinate the time-tables for the subjects which are interdependent, to ensure that syllabi, textbooks and examination criteria in the inter-related fields complement each other and in this way create the necessary conditions for more integrated teaching in the schools. This would call for a change in attitudes and in the distribution of responsibilities at this level, which is at least as revolutionary as that required in the classroom.

2. The adjustment of subject-matter

a) The general problem : selection, elimination, compression

Schools have always been obliged to choose from the available knowledge those elements which in their judgement contributed to their concept of pupils' education. For obvious reasons - e.g. the static state of knowledge and the clear but limited objectives of teaching - this was an easier task in the past than it is at present, where the definition of what should be taught in the schools has come to be one of the main pre-occupations of educational policy-makers and administrators. This is, of course, largely due to the evolution of the natural and technical sciences and, in a general way, to the development of research and of communication of research results in all fields of knowledge. It is also due to the changed objectives of teaching, in particular at the secondary level, complicated by factors such as the exigencies of life and employment in a rapidly changing society.

Increasingly, the problem of selection is resolved in terms not of how much is learned but what and how. This follows from the role of the school as essentially one of preparing pupils to acquire, during all their active life, new knowledge and attitudes corresponding to the world as it develops. This perspective of life-long learning introduces an important element to the curriculum-maker's choice in deciding what is relevant and what is inessential for inclusion in school programmes.

Within this context, two criteria remain essential in guiding decisions as to what should be included in the curricula. There is, in the first place, the need to relate subject-matter to pupil's abilities and interests, varying with age, social origin, cultural background and the time available for learning. This may seem commonplace, but in fact very little has actually been done to redefine the implications of this concept in terms of the new situation confronting the schools as a result of the educational explosion of our times. Nor have the curricula in general assimilated the findings of child psychology and the psychology of learning concerning the special conditions to which the learning material and its presentation should correspond at each particular stage of the child's development. School curricula have, for example, for a long time ignored the fact that a large group of children come to a real understanding only through a more concrete approach and by means of practical activities, the latter having traditionally been associated with lower levels of intelligence and related mostly to vocational training. Recent curriculum development work, especially in language teaching and "general science" courses, shows signs of a growing appreciation of these factors which are of course particularly pertinent to the preparation and use of new teaching aids and devices.

Secondly, the selection of subject-matter should be based on the definition of what is fundamental and essential in every field of knowledge and to the specific objectives of each level and type of schooling. Inevitably, this calls for judicious initiative on the part of both teachers and educational administrators as the only way in which the perennial problem of overloaded syllabi can be resolved. Experience has shown that eliminating obsolescent curriculum material is even more difficult than the introduction of new subjects. The difficulties cannot be imputed simply to the inertia of educational personnel. Very often established examination requirements and practices, applied by examiners or as part of a system more or less extraneous to the school organisation, are in the main responsible. On the whole the role of examinations in inhibiting change is a subject which has not received adequate attention by those responsible for curriculum development work in OECD countries.

b) The case of science and mathematics

In the recent history of curriculum reform, science and mathematics occupy a special, and privileged, position. The changes which are now universally taking place in these subjects reach beyond the connotations of the term adjustment. The very term "new" mathematics, "new" biology, etc. which is being used, expresses the comprehensiveness of these changes.

All countries are unanimous in acknowledging the key position which these disciplines occupy in education, in particular as the main instrument by which pupils are trained to fulfil their future role in socio-economic development. Yet the differences between the OECD countries' curricula in terms of time devoted to science and mathematics, in the variety of disciplines taught, in the age at which they are taught and in the syllabus in use, are at least as great as in other disciplines.

With regard to time allocation (1) some countries allot to these disciplines a large place in literary as well as in science sections, whereas in others their place is a modest one in all sections. Whether this is a consequence of purposeful policy or merely of ad hoc developments, the somewhat paradoxical situation which results is that the graduates of science sections in several OECD countries have received much less science and mathematics education than the graduates of the literary sections in some other countries. This is confirmed by comparing the total hours of science and mathematics in literary and science sections in various countries given in Table 2 (2).

Differences also exist as to the year in which the several disciplines are introduced in the curriculum : mathematics, as distinct from arithmetic, is taught as from the 5th-7th year of schooling and, except for the humanities streams in a very few countries, is continued without interruption until the completion of secondary school. The "natural sciences" are usually introduced in the 3rd or 4th year, except for a few countries where they are taught from the first year on ; the term covers, however, a great variety of subjects (natural history, biology, botany, zoology). The present tendency is for the "natural sciences" to be grouped together under "general science" in the sense discussed earlier in this report. Physics appears in a few countries in the 5th or 6th year, in most only between the 7th and 10th year of schooling ; chemistry, if it appears at all, occupies a very modest place and is usually introduced one year after physics ; in many countries students in the arts sections receive no tuition in chemistry at all, or at best one year only. "Other subjects", such as geometry, cosmography, astronomy, are taught in only a few countries, and usually in the last years of the science section.

These indications cannot, of course, give a real insight into the role of science and mathematics in the curricula of various school systems. They do, however, lend substance to the view that few, if any, are the countries in which the time and position allotted to science in school programmes are such that they meet the prerequisites considered satisfactory by the representatives of the sciences. If, in fact, as is by now generally recognised, science and mathematics are to be considered as one of the constituent elements of general culture, their contribution should be adequately reflected in all the stages of the educational process. It cannot be said that the curriculum tables of a number of OECD countries provide conclusive evidence that this position has so far been reached.

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(1) See Table 1, page 38.

(2) From the table it can be seen that the "high" countries are : Sweden (68 and 93,5 for humanities and science sections respectively), Denmark (76 and 103 - 105), Norway (77/83 vs 100/106), Turkey (88 vs 104), Greece (80/85 vs 99), Yugoslavia (90 vs 112) ; the "low" : the Netherlands (55/59 vs 79/83), Italy (60 vs 72), France (48/50 vs 71/81). See footnote 1. to Table 2 for method of calculating the totals.

Table 2

Total number of sciences and mathematics hours in primary and secondary education in selected OECD Countries (1) (2)

Country	Mathematics		Natural Sciences		Physics		Chemistry(5)		Other		Total incl. Maths.		Total excl. Maths.	
	Hum.	Sci.	Hum.	Sci.	Hum.	Sci.	Hum.	Sci.	Hum.	Sci.	Hum.	Sci.	Hum.	Sci.
Austria . . .	37	39–44	16	16	15	17	4	6	–	4–8	72	82–91	35	43–47
Belgium . . .	44–45	50–57	21	23–31	2	4	2	4	–	–	69–70	81–96	25	31–39
Denmark . .	52	58–63	15	15–22	9	17–21	0	6	–	–	76	103–105	24	42–45
Fed. Germany	42	48	12	16	7	11	5	9	–	–	66	84	24	36
France . . .	34	43–52	6	12	6–7	10–11	–	3	2–3	3	48–50	71–81	14–16	28–29
Greece . . .	38–43	51	10	10	27	34	–	–	5	4	80–85	99	42	48
Italy	36	43	15	16	5	8	3	4	1	1	60	72	24	29
Netherlands .	40	48	7–8	11	5	10–11	3–6	9–10	–	1	55–59	79–81	15–19	31–33
Norway . . .	49–55	58–64	20	20	4	16	4	4	–	2	77–83	100–106	28	42
Spain (3) . .	52		20–27		18		8		–		98–105		46–53	
Sweden . .	41	51	17	15	6	16,5	4	11	–	–	68	93,5	27	42,5
Switzerland (4)	45–50	54–58	10	12–13	3–4	4–6	2–4	3–7	–	4–6	60–68	77–90	15–18	23–32
Turkey . . .	46	53	21	24	13	16	8	11	–	–	88	104	42	51
Yugoslavia .	45	51	25	27	12	17	8	11	–	6	90	112	45	61

(1) Representing the total number of weekly hours from the beginning of primary till the completion of secondary education, specified separately for humanities and science sections

(2) Mathematics includes, for the purposes of this table, arithmetic.

(3) No separate figures for humanities and science sections available.

(4) Combined figures for Geneva and St. Gallen.

(5) Chemistry teaching is sometimes included in the hours for physics teaching.

+ Where two figures are mentioned in one column they refer to the range from lowest to highest number of hours in countries where several programmes of each type are parallel. It must be stressed that the designations "humanities" and "science" include each a variety of programmes and that therefore comparisons between countries are only of very limited value.

Yet, science and mathematics represent the one area where substantial progress has been made, as a result of both national and international initiatives, in the direction of defining a new role for them in education and of renovating their content and methods for instructional purposes. OECD's S.T.P. Committee has taken a vigorous lead in such improvements and widespread interest has been generated. This is not the place to go into the details of the Committee's past work in science and mathematics teaching, which have been recorded elsewhere (1). But it should be emphasised that one of the most important aspects of this work consisted in the preparation of fresh and up-to-date teaching materials. This is not merely a matter of incorporating the latest research developments, but rather one of effective organisation and presentation followed by pilot experimentation as a result of which changes can be encouraged in country policy. It is in this sense that the Committee's work has been truly pioneering and has led to a movement which has taken firm root in the Member countries calling for emulation in other fields. Perhaps the most important general lesson that can be drawn from this experience is that it has pointed the way in which every subject or subject-group should be scrutinised as to the purposes for which it is taught, whether the purposes are fully justified and whether instruction in the subject is realising them.

The special difficulties encountered in adjusting science and mathematics curricula arise from the fact that the coherence between these disciplines is much greater than between any other group of disciplines, so that changes in any of them affect all the others. At the same time, adjustments or changes in these subjects need to be comprehensive, i.e. they affect the teaching of the discipline in question at all levels of education ; "new" mathematics introduced at only one particular level of education risks disrupting all mathematics teaching.

This is well illustrated by the recent history of curriculum reform activities in the OECD countries. As already indicated, efforts were for a long time mainly concentrated on the curricula at the upper secondary level. It soon becam clear that the elementary science which the pupils had been taught in junior secondary and elementary schools needed to be adapted if it were to serve as a useful basis for more advanced science teaching. Emphasis, therefore, has been shifting to the elementary and junior secondary levels. Special projects for this level have been developed in the framework of most U.S. curriculum reform projects and in the United Kingdom Nuffield Foundation curriculum work. In all OECD sponsored international seminars the urgency of reforms at these levels was reaffirmed as the only way in which a balanced science curriculum could be maintained. This calls for a much more massive and comprehensive effort, some aspects of which will be discussed later in this report. The important point to note here is that this is not merely a matter of course-revision, but of re-defining curricula in the light of the functions of education, which in their turn are being re-defined.

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(1) See particularly Chapter I of the Progress Report, STP (64) 8, (OECD Document).

3. Co-ordinating levels of learning

Continuity and co-ordination between the various levels of education, which may be the most obvious principle in curriculum-building, is actually the one that has been applied the least systematically. Whereas curriculum reform has so far concentrated on the upper secondary level, the changes in the structure of education, in the nature of the curricula offered and in the methods of teaching, have affected above all junior secondary education. In many cases upper secondary programs have not undergone these more fundamental changes. Now that the graduates of the revised junior secondary schools are pressing for admission to the upper secondary programmes the need for the adaptation of the latter has become urgent (1). In the meantime this discrepancy has led to measures of expediency such as the introduction of eliminative selection at the entrance to upper secondary education and emergency courses to fill the "gaps" in the pupils' knowledge. In some cases, a "feed-back" process has been observed : the static requirements of upper secondary programmes have often hampered the implementation of reforms in structure, methods of evaluation and of teaching at the preceding, junior secondary level. At the same time, the re-organisation of junior secondary education has consequences for what should be learned in the elementary schools. The curricula of the latter, however, on the whole still conserve features which correspond to their function in the past when elementary education was, for the majority of pupils, of a terminal nature.

The need for the co-ordination of teaching at the various levels is forcefully promoted in the regulations concerning the new Swedish gymnasium. "Even where two subjects are taught in different grades, it is possible to co-ordinate them. This kind of co-ordination may be illustrated by the following example : mathematics is an important complement to technical subjects and the natural sciences and also, particularly for statistics, to the social sciences. The time-tables are arranged so that mathematical instruction will be available when needed in other subjects." (2). In this approach the treatment of the curriculum of all levels and types of schools is conceived as one great, logically built-up sequence, in which each stage is purposefully related to all the others.

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(1) A particularly striking example is provided by the situation in Italy, where science teaching for the pupils who pass from the "scuola media" to the classical lycees is interrupted for two full years, and for those who go to the science lycees for one year.

(2) Translation from "Läroplan för Gymnasiet" in OECD document DAS/EID/65-83, p. 11.

C. The relationship between curriculum and instruction

The "how" of teaching and the nature of the techniques employed have for centuries undergone little change. The image of the teacher lecturing to a class of children who take notes, and learn their lessons, is valid for the Mesopotamian school as well as for the mid-twentieth century.

Most of the new developments in the methods of teaching and the resources employed are of very recent origin. One of the main factors which has promoted their prodigious development in so short a time is no doubt the fact that the production and distribution of teaching aids were promoted by industry. Another reason is to be found in the development of education itself : in a more comprehensive system of education new resources must be tapped in order to provide adequate education to a school population with a large range of abilities and interests. Differentiation in a comprehensive school system is largely assured by variation in the "how" of teaching and much less by different types of schooling.

1. The development of teaching aids

Recent surveys (1) show the extent to which some new teaching devices, such as school radio and television, are used. Figures for Japan show that already in 1962 nearly 100 per cent of primary and secondary schools were equipped with radio and that 75.5 per cent of primary, 59.5 per cent of lower secondary and 47.4 per cent of upper secondary schools had television sets (2). In the Yugoslav State of Croatia in 1965, 1,800 out of a total of 9,000 schools were equipped with television sets. Until relatively recently most teaching aids were used for illustration purposes ; television was in the form of "enrichment" of regular teaching or a substitute for it. Many of the new devices were used in pilot schools only, while schools which were eager to use them more generally were inhibited by limited resources. The proliferation of teaching aids, both simple and increasingly sophisticated, has been accompanied by a changed attitude to the _use_ that can be made of them. They are no longer regarded as an extraneous element but are increasingly integrated in the learning process, calling for judicious choice and use by the teacher.

This process of integration is still far from being completed, as is shown by the moderate enthusiasm with which the introduction of new teaching methods and techniques is greeted by the teachers. It must be admitted that the nature of the development has been such as to provoke in many teachers a psychological resistance to the introduction of such "aids to teaching and learning" as they should properly be regarded. This obviously cannot be attributed merely to any ingrained conservatism of the teaching profession ; it is rather the result of failure to involve practising teachers in the initial experimentation with new devices and techniques and to develop, in partnership with them, the whole concept and purpose of such aids in the process of teaching and learning.

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(1) See, for example the report prepared by the Secretariat to the Fifth Conference of European Ministers of Education, op. cit., Table 26, p. 121.

(2) See "Education in Japan. A Graphic Presentation", op. cit., p. 122.

On another level, the most serious criticism which can be formulated against this development is the discrepancy between the technical possibilities opened up by the new media and the extent to which their pedagogical implications have been systematically studied. In a field such as that of programmed learning, for example, the scarcity or absence of appropriate programmes for the machines which have been made available to schools has sometimes led to grotesque situations.

The curriculum is a powerful factor in learning ; but the efficiency of learning is also affected by classroom organisation, by techniques of teaching and by available equipment. Innovations and improvements in what is to be learned will be profoundly affected by how things are learned. It is in this sense that developments in educational technology may ultimately provide an important breakthrough in educational thinking and practice by focusing attention on the essence of the process of learning, and of teaching, as a matter calling for intensified study and research.

2. The curriculum and other forms of learning

a) The role of other forms of learning in the school

Among the new types and organisation of teaching the use of activities which lie outside the curriculum strictly speaking, or which by their nature occupy a special place, has in the recent past been considerably extended ; in many countries these activities have now become an integral part of the teaching process, as against their past vague role in cultural enrichment or in cultivating hobbies or other individual preferences considered unworthy of inclusion in the time-table. They have been transformed into the device par excellence for ensuring the differentiation in approach, speed and choice of subject which regular class-teaching does not provide. Employed in this sense - as they are in a most outspoken way in the upper forms of the 8-year primary school in Yugoslavia - they fulfill the role which is elsewhere met by a certain number of options in various subjects or in streams and sections.

It may be foreseen that the role of such activities will increase further with the postponement of differentiation in special types of schooling or streams and also as a consequence of the introduction of more learning aids. The relative newness of this development makes it all the more important that the experience gained in some OECD countries should be made known to the others. In this context, the systematic approach to the organisation of teaching in the new secondary schools in Sweden is of particular interest (1).

Special mention should also be made of the importance of extra-curricular activities in what concerns science education, where work in small groups out of school-time, excursions, field-work, summer camps, editorial work on school science journals and similar activities are significantly complementing normal classroom teaching. In many OECD countries (2) these activities are organised by Youth Science Clubs. They have helped to bring about a clearer recognition of the importance of the active interest of the pupils in the teaching situation and of the discovery of their own abilities and their curiosity, and their contribution to increased interest in science and in scientific careers has been considerable.

b) Sources of learning and information other than school education

Related with the above problem is the growing impact in modern society of sources of information and learning other than the school, and the consequent recognition that the school no longer has a monopoly of the educative process. "The factual knowledge, standards of intelligence and sensibility which the teacher inculcates in the child through the medium of the spoken word, the blackboard and books, now represent no more than a small island in the midst of the flood of information, stimuli and exhortations, conveyed by sound and image, by which the pupil is assailed outside the school, through posters, cinema, television, strip cartoons, radio and popular songs"(3). The author, significantly, called the series of articles from which this sentence is quoted "L'école parallèle".

The importance of this "parallel education" is reflected in the stress which is given in the curricula of many countries to methods whereby teaching can be made into a confrontation with, and an elaboration on, the world by which the children are surrounded. In the "general science" course and in the "nature and social studies" for the junior secondary schools in several OECD countries, the world in which the child lives is the point of reference from which notions about the rules and the general principles of science are developed. The fundamental weakness of many attempts in this direction, however, is that the "real event" is only used as a starting-point to attract the children's attention. Integrating "parallel education" and "school education" into a real unity of information in which both play their proper, but different, roles requires from the teacher that he is thoroughly acquainted with both worlds and that he realises the limitations of his contribution to the child's education.

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(1) The forms of activity as they are described under heading 4.2 in the "Läroplan för Gymnasiet" serve, in fact, not only to achieve the individualisation of teaching to suit the pupil's interests and abilities, but also to teach pupils to work independently, and in co-operation with others, on larger projects.

(2) e.g. in the U.S.A., France, Belgium.

(3) Georges Friedman in "Le Monde", Jan. 7, 1966.

The appearance in the life of the children of a host of extraneous information media has put the school before an entirely new task which has been defined as "éduquer le consommateur", teach the pupils to become, from "mere consumers" of mass media, critical users. This implies for the teacher that he must himself be familiar with these media and that he is prepared to call on experts wherever his competence is insufficient. It requires also that the curriculum keeps the way open for these initiatives and that there is a place in school administrative and budgetary arrangements for the use of outside experts. The integration of the school in the community, as it is advocated, for example, in Yugoslavia and, in a different way, in the U.S., facilitates such practices. The educational system, admittedly, has many points of inbuilt resistance to such an approach, but the task is too urgent to allow arguments of prestige or organisational difficulties to prevail.

3. Continuing education

At several points in this report reference has been made to the expanding role of continuing education and its implications for school curricula.

Adult education has definitely gone beyond the stage of merely providing workers in their leisure-time with an introduction to "general culture" which they had missed in their formal schooling. Training on the job has now become the necessary counterpart to school training in the acquisition of technical skill. In some countries correspondence courses play an important, though often little known, role in specialisation in technical and commercial skills. In many branches, informal training systems of all types run parallel to formal schemes. Their importance in supplementing formal education differs from country to country ; in general, they are more developed in the industrialised countries than in those with a developing economy, but the general trend is to increase their role. This will mean that in future the main function of all these types of informal education will be the continuing re-adaptation and re-training of the individual to the changing requirements and conditions of his socio-cultural and professional life.

There is, therefore, an urgent and general need for the co-ordination of formal and informal education (1). This will have significant implications for school curricula, particularly at the secondary level and above all for those of technical education which can thus be relieved of content matter which does not form an indispensable part of basic training. An example of this development is given by the new curricula for the secondary schools in Sweden and Yugoslavia, which explicitly recognise this perspective and attempt to accommodate its consequences.

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(1) See, on this, OECD document STP (66)10 which contains concrete proposals as to this co-ordination for the countries participating in the Mediterranean Regional Project. For a discussion of these problems in connection with the development of secondary education see document STP (66)9 which outlines the secondary education system of the future as it emerges from the work on the first phase of the Mediterranean Regional Project.

D. The co-ordination of curricula with school organisation

Many of the problems which arise under this heading have already been alluded to in earlier parts of this report. They are largely the consequence of the need to adapt school programmes and curricula to accommodate the new and varied interests represented in the expanded school population and the bearing which this has on the structure of the school system, the organisation of teaching and the whole question of evaluation and the role of orientation and guidance.

1. School structure

In the past, new requirements in secondary education were mostly met by the addition of new courses of professional and technical training to already existing programmes. The early selection which this implied appeared incompatible with the optimum promotion of all available talent and of equal educational opportunities which had been at the basis of the expansion. Attempts to make good this deficiency are reflected in the restructuring of the educational system which has been taking place in most OECD countries.

Increasingly, however, the differentiation formerly provided for by the actual structure of the system is achieved by and within the curriculum. This means that whatever the structural and organisational arrangements in force, the danger of differentiation becoming prematurely determinant in the scolastic or vocational career of pupils can only be obviated through curriculum flexibility ; in other words differentiation must take place within the class. This presupposes a highly individualised curriculum in which each pupil can choose his own programme, in tempo and level of difficulty adapted to his abilities and interests, as the sine qua non for the efficiency of comprehensive education.

Junior secondary education in the OECD countries, though it still shows a wide range of structures, from fully comprehensive to selective systems with rather rigidly separated parallel types of schooling, is characterised by a strong tendency to reduce the number of programmes and curricula and increase the common general part. The differences which still persist between the countries concern mainly organisational arrangements as indicated above, each of which, of course, has implications for the flexibility of the system in terms of transition between the several programmes.

Their common objective, however, is to offer a broad general curriculum and to provide for differentiation mainly in the variations within this common framework.

Re-organisation at the upper secondary level has been slower, the consensus as to types and structures being much less general. Conflicting forces have been more active at this level, according to the various objectives served by the educational system : further completion of general education, preparation for higher education, training for the labour market. The development of these three sectors has profoundly changed the expectations put into teaching at the upper secondary level. Perhaps the most important evolution is the growing convergence of the several areas of interest which affect upper secondary education : the increasing part of general education in technical training programmes, the introduction of technical and commercial streams in academic types of upper secondary education, transfer of specialisation to out-of-school training courses. Definitive choice as to further education or technical specialisation tends to be increasingly deferred.

Emerging from this highly complex cluster of interests and developments is a trend towards the simplification of the structure of upper secondary education with a concomitant reduction in the variety of programmes. Though co-ordination between programmes rather than unification is the main method used to facilitate the transfer of students at this level, the trend towards a less "compartmentalised" curriculum organisation is clear. Prominent examples of this development can be found in several countries, in particular in the recent or planned reforms of upper secondary education in Sweden, Yugoslavia and France. There is, in any case, general recognition of the interdependence of the structure of the school system and the curricula. As a consequence curriculum planning and development includes study of the problem of structure and organisation of the school system.

2. The organisation of teaching

This new function of the curriculum as an instrument of differentiation has important repercussions on the organisation of teaching which, as already stated, has undergone little change over the centuries. Science and technical education have given a forceful impetus to breaking up the traditional static classroom situation. Practical work in these subjects requires smaller groups and thus leads to abandoning, at least temporarily, the concept of the class as one unit. Science teaching also often needs longer time units in order to be effective, thus breaking up the traditional teaching hour pattern. These developments, reinforced by purely pedagogical considerations in favour of a more active participation by the pupils in the learning process, have led to new forms of classroom organisation. In some countries extra- and para-curricular activities represent a new departure in school organisation, introducing new forms of teacher-pupil relations, an entirely new approach to subject-matter, and pupil groupings which transcend the grade-system.

The transformation of traditional classroom teaching poses serious organisational and pedagogical problems (1) which can only be resolved gradually and on the basis of experimentation and evaluation. Innovations in this area call, above all, for flexibility in attitude on the part of administrators and teachers and the adaptation of the rules and norms of central, regional and local administration to make this flexibility possible. In Sweden, for example, the upper grades of the 9-year comprehensive school can have a number of sections of a clearly defined type. The schools, however, are only obliged to provide such sections if a minimum number of pupils want to attend them. None of the two-tier school systems have gone so far in loosening up classroom organisation as many U.S. high schools or as the experimental Trump system (2) but there is a definite trend in this direction, always within the permissive limits of existing administrative structures.

One of the major problems arising in this context concerns the minimum size of schools and classes needed if adequate programme differentiation is to be effectively offered. In the United Kingdom, for example, the introduction of comprehensive schools has led to an animated discussion about the minimum intake these should have in order to be able to offer a full range of courses. In Sweden the problem has received much attention in connection with the implementation of the 9-year comprehensive school. An intake of about 100 pupils a year is considered as an absolute minimum to guarantee that all programmes can be offered in the upper grades. In several OECD countries central schools for larger intake-areas are being set-up as a means of overcoming the difficulty of providing adequate differentiation in the higher grades where the intake is too small. This also ensures that less populated rural areas, already culturally disadvantaged, are able to provide the full range of programmes in their secondary schools, as otherwise the introduction of more comprehensive secondary education would become merely another handicap, instead of a stimulus, to their cultural and economic development. Obviously this concern about minimum school size is closely linked to the concept of differentiation in special streams, in particular those with vocational bias. Where the differentiation is mainly achieved by variations in the tempo of learning and in the level of difficulty of the programme, an effective application of modern learning aids, supplemented by correspondence and TV instruction, can assure the required programme flexibility in schools with smaller intake numbers. It is considerations of this kind that give substance to the practical meaning of the "democratisation" of education of which the adaptation of the school to the individual abilities and interests of the pupils is the leading idea.

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(1) Among the consequences of new curriculum approaches is the necessity to look more closely at the traditional school building itself, conceived as it is mainly in terms of blackboard teaching to classes of uniform size. The attempt to break down subject barriers suggests, for example, the provision in ordinary teaching spaces of facilities for a certain amount of practical work ; innovations like team teaching, "abandoning the concept of the class as one unit", and "breaking up the traditional static class room situation" mean that the classroom itself ceases to be the main basis of school planning and that a much wider variety of size and kind of room is needed. Even though teachers usually show great ingenuity in adapting to their environment, their efforts can be aided as much by suitably designed buildings as by appropriate equipment and apparatus. Increasing awareness that this is so is marked by the growing number of OECD countries which are setting up "development groups" for school building. These groups consist of educationists, administrators and architects working together to study the problems raised and to lead in the design and execution of new or adapted schools designed as effective educational instruments for the new methods of teaching and learning which are introduced. (See OECD Publication, "School Building Resources and Their Effective Use", OECD, 1966).

(2) See the footnote on page 44.

3. Evaluation and the role of orientation and guidance

As pupils' abilities and interests are not static, but develop and mature in interaction with the environment, education should by definition be a sequence of ever new choices and options. It is important, therefore, that the structural framework within which these choices are exercised be as flexible and as permissive as possible. In consequence, the functions of pupil evaluation and guidance are seen in a new light, no longer as restrictive or static elements but rather as opening up possibilities and pointing the way : their traditional control function makes way for an orientation function continuing throughout the pupil's scholastic career.

It is obvious that such a function would call for a reappraisal of school examinations' objectives and practices. This appears to be the most difficult part of any educational reform for various reasons such as, for example, the poor articulation between development work at various levels of education and the various types of schooling and the lack of co-ordination between the mechanisms for curriculum development and those which set the examination requirements. Above all, no other satisfactory method has yet been devised to fulfil the indispensable role which examinations play in the educational process in providing concrete evidence of attainment for all parties concerned -pupils, parents, teachers and educational policy-makers.

Progress in this direction will be determined by the extent to which school systems can devise an efficient guidance and orientation mechanism. Certainly, great efforts have been made in several OECD countries to train teachers and/or guidance officiers in the appropriate techniques. However, this has turned out to be a much bigger task and to require much more time than had been expected by educational reform planners. One of the main difficulties is the sheer size of the task for which no country had the required number of training centres, or of specialists able to train teachers or guidance personnel. In addition, much more needs to be done in the development of evaluation and orientation techniques and criteria and their adaptation to the specific needs of each country and of each type of schooling.

This is an area calling for intensified development work in close liaison with curriculum adjustment efforts (1).

III

METHODS AND MECHANISMS OF CURRICULUM CHANGE

From the survey, attempted in the previous chapter, of the concepts and factors which determine school curricula and of the specific factors and forces which underlie the present needs for change, it will be seen that curriculum development work operates at two main levels, calling for different skills and responsibilities :

a) The general problem of content and distribution of subject-matter in education ;

b) The definition in detail of the content of the courses in the various subjects at the various levels.

Broadly speaking the former aspect relates to the general philosophy on which educational systems are based, a philosophy which is essentially determined by socio-economic and political factors. The latter, on the contrary, is primarily an educational exercise based on pedagogic considerations.

The argument which has been developed in the preceding chapters is that these two aspects cannot be treated separately, either in terms of organisation or of pedagogy. The central problem for the policy-maker, therefore, is to develop ways through which these two areas can be tackled simultaneously and coherently, as parts of the general process of educational development as it is advocated in this report.

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(1) In the United Kingdom the Schools Council assumes the full responsibility both for curriculum development work and for the development of suitable methods for the assessment of educational attainment. The latter task was formerly delegated to the Secondary School Examinations Council.

It is the purpose of this chapter to consider in detail the elements on which this approach to curriculum development may be based and which operational functions it has to fulfil.

A. Defining the objectives of curriculum development

The first function for which a curriculum policy must make provision is that of planning. Curriculum planning is in turn an essential part of educational planning, which sets out, explicitly or otherwise, the general objectives of an educational system and the means through which these objectives are achieved. It would be useful therefore to consider briefly the place which has been given to curriculum planning in general educational planning and how much guidance this planning work entails for curriculum development.

Much of the current educational planning work, both in OECD countries and elsewhere, is dominated by the manpower requirements approach, complemented by social, cultural and historical considerations. The usefulness of this approach for curriculum planning is limited by the uncertainties concerning the relationship between particular occupations and the education they require. This limitation becomes even more serious when it comes to deriving educational requirements from manpower requirements forecasts. The reports concluding the first stage of the Mediterranean Regional Project illustrate these difficulties abundantly (1). Changes in technological processes may require a change in the educational input for particular occupations, while changes in content and methods of education affect the educational input for the relevant occupations. Careful study of the functioning of the educational process is a prerequisite for the co-ordination of curriculum planning with manpower planning. Factors such as the appeal which the several curricula have upon students, e.g. preference for arts or sciences, necessitate a revision of manpower forecasts and the constraints in this sector may again lead to a revision of the curricula. In any case, more refined manpower forecasting techniques than are actually in use are needed, in particular the availability of long, medium and short-term forecasts. At the same time, a regular evaluation of the relevance of curricula to the educational "input" into the labour market is required. The M.R.P. reports revealed the insufficient refinement of the first type of data and the almost complete absence of valid data of the second type (2).

In these circumstances, and in the light of the persisting basic uncertainty which is inherent in manpower requirements forecasting the only general conclusion which can be drawn from this approach is an appeal to

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(1) See "A Technical Evaluation of the First Stage of the Mediterranean Regional Project", OECD, Paris, 1966.

(2) Ibid.

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the educational policy-makers to adapt teaching in its structure, methods and content to the new situation of a labour market whose requirements become more and more fluctuating. The answer to the problem is thus to be sought not in better manpower forecasting alone but, to a large extent, in the curricula themselves.

In several OECD countries, the "social demand approach" has explicitly been given preference over the manpower approach in determining structure, content and methods of teaching. This is particularly the case in Sweden, (1) and seems to be the case also in Yugoslavia (2). In the recent discussion on the introduction of comprehensive schooling in the United Kingdom this has also been the predominant argument. It would be misleading, however, to see these two key objectives as contradictory in any real sense. Apparent contradictions arise only in the context of specific situations calling for measures to reconcile the manpower and social objectives of education, such as have been sharply posed by the extension of the period of general and compulsory schooling. Where conflicts between the two arise, the education system gives evidence of a certain degree of immaturity and maladjustment, and this enhances the role which curricula and methods of teaching can play in striving towards streamlining the objectives of education.

The curriculum, therefore, must be increasingly seen in a new and dual role, i.e. both as one of the main instruments through which the objectives of education are attained on a unified basis, and as a factor to be taken into account in determining these objectives and in adjusting them to the educational process. Curriculum planning can only fulfil this function if it is fully integrated into the overall educational planning mechanisms. This is the new challenge which confronts educational planning in the Member countries.

B. The decision-making function

The basic decisions as to what and how schools shall teach are everywhere taken by the political educational authorities - national, regional or local. There are, however, great differences between the OECD countries with regard to the level at which decisions are taken and the elements of the curriculum upon which they bear.

In most countries the broad lines of the curriculum of each type of schooling are laid down on the occasion of major legislative acts, for the whole country and for all its schools. There remains the task of writing textbooks and producing other aids to fit into these curricula, according to the general syllabi determined by the central authority. Control over this is, as a rule, again exercised by the central authority : though the writing may be left to the initiative of teachers the use of such textbooks and other aids in the schools is subject to central authorisation. In some cases a standard textbook is prescribed for all schools, in others several books are authorised, provided they correspond to the general guidelines. In several OECD countries the powers of the central administration extend over classroom activity in great detail ; it prescribes for every period what teaching content has to be covered and in what way, thus limiting considerably the initiative of the educational authorities at the other levels.

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(1) See Chapter II of the EIP report on educational policy and planning in Sweden.

(2) See "Project for the Advancement of the System of Secondary Education", Beograd, Dec. 1965 (roneo), e.g. Chapter 2, p. 34 ff.

The system as it is practised in the U.S.A. is usually described as the other extreme. The Federal Office of Education has, with regard to decisions in these matters, no dealings with curricula, textbooks or methods of teaching. The State educational authorities may suggest courses of study for the schools. State textbook committees usually draw up a list of books for each subject from which the schools can choose. The decision-making properly speaking is, however, in the hands of regional and local educational authorities. Moreover, business, labour, parents and various pressure groups share the power in this matter with teachers and textbook writers. The curricula are thus "made to yield before the more varied character and interest of the policy-makers" (1). It should of course be remembered that in this case, as in that of the United Kingdom where individual headmasters are more or less free to determine the curricula of their own schools, there is an over-riding constraint within which this freedom is exercised, namely that which is imposed by the requirements of national qualifying, or other similar, examinations. This applies, a fortiori, to most other OECD countries.

There are also many other OECD countries where educational authorities at intermediate and lower levels share part of the responsibility : the central administration issues general guidelines but regional or local authorities are free to introduce variations in the timetables and to choose syllabi and textbooks within these broad ranges. In Yugoslavia, for example, the Council of Education has laid down a draft curriculum for primary schools, but, "the educational authorities in individual constituent republics have the right to adapt the curriculum to their specific national and regional needs. The General Law on Schools goes even further in this respect, trying to bring the school as close as possible to its environment. It gives the right to local educational organs ... to supplement the republican curriculum in accordance with their needs . ." (2).

In the case of Austria : "The Federal Ministry of Education shall by order prepare curricula for each category of school ... The Provincial School Boards shall be consulted before such Orders are issued ;

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(1) See George Z.F. Bereday : "Comparative Method in Education", Holt, Rinehart and Winston, New York, 1964, p. 110 ff.
See also Unesco : "World Survey of Education", Vols. II and III and Jean Thomas, Joseph Majault, op. cit. pp. 103 ff.

(2) See "The Elementary School in Yugoslavia", op. cit. p. 8.

moreover, it may be provided in such Orders that the Provincial School Boards, within the framework of Orders issued by the Federal Ministry of Education, can adopt additional regulations relating to curricula ..., according to local requirements ... It will be laid down ... for each category of school, which subjects ... shall be provided in the curricula ..." (1) In actual fact, however, the only decision taking power which certain types of schools have as to the time-table concerns the choice of a few "optional subjects", and in principle "the curriculum of a given type of school in Austria is the same for all pupils attending such a school ..." (2).

In the Netherlands, the regulations seem at first sight to be more flexible : the schools have to submit a timetable to the school inspector for his approval. However, the number of hours for each subject and the length of the teaching hours are fixed by law and by additional Ministerial decrees. The schools are free to choose textbooks, but these have to comply to the prescribed curriculum. The same applies to teaching methods.

The nature of the arrangements in force in individual countries determines their choice of methods and tactics for changing and adapting curricula. Highly centralised systems have the power to impose new content and methods on all schools in the country, but tend to act slowly because of the gravity of such decisions and the volume of the preparatory work it requires. In decentralised systems a certain percentage of well-equipped and reform-minded schools may adopt new methods very quickly, but a vast effort of publicity and persuasion is needed before the results can spread to a majority of the schools. This implies that methods of curriculum improvement employed, for example, in the U.S.A. will need to be adapted for use in other countries with different systems of educational administration and control, not only in what concerns content and approach, but also in terms of the policy steps needed for their preparation and implementation.

If the school curriculum is to attain its objective of enabling every child to obtain the education he needs, the ultimate decision as to what and how to learn must be taken by those who are most qualified to decide – teachers, parents and pupils. To do this intelligibly these three parties must be provided with the information they need. In this sense decision-making in curriculum matters is necessarily a decentralised process. This does not mean that decentralised educational systems are more adequate than centralised ; it means that in both a new dimension of decision-making needs to be introduced : the differentiation in approach suited to the child's individual needs and aptitudes, within the framework of an established time-table and subject-matter. This individual approach is much more a matter of speed and level of difficulty than of choice of subject. Whether general decisions as to time-tables and choice of subject-matter are taken at the national, regional or local level is irrevelant. Modern curriculum development requires the concentration of forces and may lead to more centralisation of effort, but the modes of implementation are necessarily determined in terms of individuals.

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(1) "School Organization Law 1962", Federal Ministry of Education, Wien, 1963, p. 7-9.

(2) Unesco : "World Survey of Education", Vol. III, op. cit. p. 221.

C. The role of the community

Never before in history has education been so much a matter of concern to society as it is in our times. Public opinion, through its various channels of expression - press, radio, television - clamours for a partnership in the process of decision-taking with regard to education. Society, in all its forms of organisation, wants to have its word to say and even to be formally represented wherever educational decisions are taken - employers, employees' unions, industry and commerce, consumers' groups, professional societies, political groups or parties and, last but not least, parents' organisations.

This new interest and interference in education varies from country to country in terms of effectiveness, organisation and reciprocal appreciation. The role which in the U.S.A. public opinion and social interest play in educational policy-making at all levels, and in particular at the local level, need hardly be mentioned. In other countries also, for example the United Kingdom, general and specialised press play an increasingly important role in the public debate about education. In the recent school reforms in Sweden the press has mobilised public opinion and its contribution to the discussion was highly appreciated.

As against the traditional concept of the "what" and "how" in education - i.e. the curriculum - being the exclusive concern of the internal working of the educational system, to be left in the hands of educationists, a new dimension is now being introduced in the form of the "consumers" role which has yet to be adequately defined and articulated. Several factors have contributed to bring this about, inter alia the evolution of technical training programmes, in which industry took a direct and active interest, and the development of teaching aids, where educational and commercial interests meet.

Recent developments in a number of OECD countries show a clear trend to attributing to the "consumers" or the various social groups a formal role in curriculum-making. The direct involvement of the community in curriculum-making in the U.S.A., in particular at the local level, is perhaps the most outspoken example. Developments in other countries are of more recent origin.

In Sweden the involvement of all social groups has been one of the most important characteristics of the recent educational reforms and a framework has been set up to make this into a permanent feature of educational policy. To this end, representatives of industry, commerce and the labour unions sit on the Steering Board of the National Board of

Education (1) as well as on the Board of Higher Education. In the planning stage of the recent reforms of primary and secondary education discussions were held with employers and trade unions about the structure and curriculum of the new school. The National Board of Education is at present instituting regular consultations with these groups on the modalities of the "rolling reform" of education, in which curriculum work occupies a key position. The initiative for improvements comes very often from the representatives of these groups. The National Board of Education acts mainly as the central point of convergence of these suggestions and organises the necessary consultations, research and experimentation.

In Yugoslavia the representatives of both employers and employees are regularly consulted on desirable changes in the curricula. This has been particularly fruitful in the current preparation of the new type of secondary school ; in fact the pressure for more general training, leaving professional specialisation to a later stage, came both from the workers' unions and from the employers. The involvement in the school work of all groups of the population in defining and implementing educational policy, including curriculum, is institutionalised by means of the composition of the Education Council of each commune in which trade unions, economic and social organisations, professional associations and youth organisations are represented. The same interest groups are represented on the District Education Councils and on the State and Federal Education Councils and thus participate ex officio in the decision-making process concerning all aspects of education.

In Germany the recently installed Council of Education ("Bildungsrat") has as members, appointed by the State Governments, representatives of higher education, of research, industry, workers' unions, religious groups and of the municipalities, apart from the members nominated by the Federal authorities who also represent some of these groups (2). In several other countries the participation of industry is less direct. In the Netherlands, for example, an industry-education liaison committee exists, whose conclusions are channelled to the competent educational authorities.

The involvement of social and professional groups has, of course, a much wider significance, for it is through them that educational development must become a concern of the community as a whole, and that favourable and constructive attitudes can be developed, without which the schools' work cannot be properly related to the living society around it.

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(1) This Steering Board consists of 11 members : the Director General and the Deputy Director, one representative of, respectively the Labour Market Board, the Universities and the municipalities, three representatives of the employers and three of the unions (in which the academic community is represented).

(2) See "Hochschuldienst", Vol. XIX, No. 4, 23rd February, 1966, p. 4.

The academic community

The role to be assigned to the academic community in curriculum development is a much more vital one ; to them is entrusted not only the promotion and custody of knowledge but also to a large extent the training of teachers. Curriculum planning and development in which the academic community does not play a leading part is severed of its sources and its supplies.

Paradoxically, in several OECD countries the interest of the academic community in the schools and their development has gone little beyond the preparation of pupils for higher education in terms of the requirements laid down by the latter ; opposition against recent educational reforms was in some countries strongest among higher education representatives. Fortunately individual academic teachers have in many cases taken the lead in curriculum improvement activities. The OECD sponsored curriculum work has drawn heavily on the contribution of specialists from higher education, who were the only ones able to restore in the natural sciences and mathematics the connection between secondary school teaching and the advanced state which these disciplines have reached in the past few decades. The curriculum development work undertaken in the U.S.A. and the U.K. is equally heavily dependent on the academic community. Most of the current work in the U.S.A. is located in , and to a great deal staffed by, institutes of higher education.

On the whole, however, the role of the academic community in curriculum planning and development has up to now been incidental, corresponding to the ad-hoc nature which characterised curriculum reform as such. It seems essential that in setting up mechanisms for this purpose the academic world be involved on a permanent basis not only in curriculum development work in individual disciplines or fields, but in the overall curriculum planning and policy-making process. In this way its "splendid isolation" with regard to secondary education development in particular will come to an end, to the benefit of all parties concerned.

In several OECD countries the first steps have been taken in this direction. Higher education is ex officio represented on the Steering Board of the new Foundation for Educational Research in the Netherlands, on the Steering Board of the National Board of Education in Sweden and on the "Pedagogical Working Groups" within this Board, whose first aim is curriculum development, on the new Education Council ("Bildungsrat") in Germany, on the Schools Council in the U.K., on the Educational Research and Planning Office in Portugal, etc. It is to be hoped that this formal representation on the national bodies concerned with the continuous reform of education and, in particular, of curricula, is the prelude to a fuller involvement of higher education in the planning and development of education as a whole, which is becoming all the more imperative because of the increasing importance which is attached to research and experimentation in this field.

D. The function of subject-matter in curriculum reform

Subject-matter is the hard core of the educational process. Its relevance to general educational goals determines the efficacy of the whole effort.

Subject-matter revision is not, as has often been thought in the past, a mere matter of submitting each discipline to a rejuvenation cure ; it has to be carried out along two main lines : it must adjust the content of teaching to the latest developments in the state of knowledge and, at the same time, adapt its choice and its presentation to the particular exigencies of the type and level of schooling where it is taught. This can only be done satisfactorily if it is the joint venture of specialists in the field in question and specialists in pedagogical matters. In practice this means research workers and university representatives on the one hand, teachers and educationalists on the other.

The process of subject-matter revision necessarily comprises several stages :

- The scrutiny of the present state of the subject and the determination of those of its latest developments which are relevant for teaching ;
- The "translation" of these topics in pedagogical terms : what can be taught and how at the various levels and in the various types of schooling ;
- The preparation of guides for teachers ;
- The production of textbooks and other aids.

These stages are well illustrated by the OECD sponsored activities in science and mathematics. In an international seminar the status and development of science teaching in the Member countries was confronted with the new developments in the respective subject-field and conclusions were drawn as to the adjustments needed to bring teaching in line with these developments ; in an international working session it was then discussed how these adjustments could be worked into resource material for teaching ; in the same working session or, in some cases, in a special session, a guide for teachers was produced on the basis of this material. The production of text-books and the application of the new material in class-room situations was left to individual national authorities through sponsored pilot projects.

The choice of the participants for these activities had to be made very judiciously : in order to prepare the ground for a co-ordinated approach to science curriculum improvement it was important to have represented not only eminent scientists and university teachers and representative members of the teaching profession at the secondary level, but also those who actually determine and control the curriculum-making in the participating countries. Therefore representatives of the national administrations and of the inspectorate played an important role in the seminars and, sometimes, in the working sessions. The choice of representatives of these several groups was in the first place determined by the concern to create in the OECD countries a climate favourable to science curriculum development.

The efficacity of this approach is evidenced by the impact which OECD work in science education has had on country policy. By no means the least advantage was that science curriculum improvement advocated by such a prominent international forum was easily accepted by national authorities who otherwise might have been hesitant to break with traditional methods.

E. Developing and producing learning aids

As indicated earlier in this report, the rapidly growing educational technology is to a large extent based on the use of modern teaching aids and devices which contribute both to resource-building in education and to enhancing the effectiveness of learning. They provide the means *par excellence* of pupil motivation and interest in his education.

The development and the production of suitable learning aids of all kinds, and the research and experimentation required in this process, should be one of the key aspects of a curriculum development policy. It needs to be carefully coordinated with the other functions, in particular with subject-matter adaptation and with study of the learning process. The difficulties in establishing this co-ordination have increased with the ad hoc proliferation of learning aids in contemporary education, and, also, the growing commerical interest in their production. In the past, in many countries, co-ordination problems did not arise, partly because the production of aids presented no great commercial interest, partly because the educational administration had established a firm control over the type of aids used in the schools. The "rolling" reform of subject-matter, the increased need for experimentation before new devices are utilised and the explosion of commercial interests have now created a situation in which the integration of new learning aids in the teaching process is one of the main concerns of educational policy.

Modern aids require big resources which are beyond the range of the individual schools and local educational authorities. They can only be mobilised by the State or by big industrial concerns. On the whole, private industry, with its technical know-how and production capacity, has taken the lead in the matter (1) and the result has not always been to the liking of educational policy makers. Hence the recent trend for closer response and new initiatives from within the educational system itself.

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(1) The massiveness of private industry effort is particularly striking in the U.S.A. An impressive example, among others, is the recent joint venture of General Electric and the Time-Life concern, set up to market educational systems.

This is reflected in the setting up, within educational administrations, of special mechanisms for co-ordination in this field, and, where necessary, the development and production of learning aids. A few examples may be useful.

In Sweden the National Board of Education undertakes or commissions the necessary research and experimentation. Private industry produces the learning material, but the Board supports the production of material which cannot be supplied on a commercial basis. Information meetings are organised with industry's representatives and these also spontaneously seek advice from the Board. A special Committee was set up at the end of 1965 to investigate the production and control of learning aids. One of the Committee's concerns is to study the pros and cons of establishing a state-owned company for their production. It is also studying the problem of standardisation of expensive learning aids (1).

In the United Kingdom the promotion and production of learning aids of all kinds has in the past few years become an important issue in educational policy. In France the Centre Audio-Visuel de Saint-Cloud has acquired a rich experience in performing these tasks. In Yugoslavia the development of modern learning aids, which was formerly the domain of local education authorities and of industry has in the past few years been largely taken over by the federal educational authorities.

In the promotion of the use of new learning aids school finance is a determining factor. If this is left to the schools' initiative the "good" schools tend to become well equipped, while the "bad" schools remain as they were. Therefore in several countries a special sum of money in the schools' budget is earmarked for the purchase of new learning aids, the use of which depends on criteria set by the sponsoring central administration. Thus a stimulus is given to the use of modern learning aids and, at the same time, an un-economic diversity in the types of aids can be avoided.

The co-ordination of learning aids must also be achieved in the actual teaching process. This is becoming an urgent problem, and can only be solved if the teacher is able to judge and choose when, where and what to use. In educational television for example, the use of video-tape recordings will greatly increase the teachers' autonomy in using T.V. as a learning aid in combination with other devices ; attempts are already being made to combine educational television with programmed learning and to link practical work in science with programmed material (2). The stage has been reached where a determined effort is called for to enlist the full support and co-operation of the teaching world in these developments, which are bound to revolutionise the traditional role of the teacher himself by relieving him of trivial training and repetitious work in the interest of more qualified and responsible tasks. The teacher will in fact tend to become more and more a co-ordinator of educational resources.

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(1) See EIP report Sweden, op. cit., Chapter X.

(2) See K. Austwick in the OECD Document on Programmed Learning, DAS/EID/65.46, p. 67.

International action and co-operation in learning aids can be particularly rewarding, as has been demonstrated by past OECD work. The need is greater for the developing Member countries which lack the necessary intellectual and material resources and have no industry to fill the gap in this field. Many learning aids are of an "international" character and of universal application, subject to adaptation to specific national conditions. The obvious example is teaching machines and science teaching apparatus, which most of the countries purchase from abroad. In this context the need for documentation is badly felt by many of the smaller contries. Facilities such as the OECD Science Film Service (1) and the surveys and seminars on the use of television in the teaching of science and technical subjects have partly provided for this need. The training of experts in television teaching and programmed teaching represent other urgent needs which rely on the experience obtained in the most developed Member countries. Mention must also be made of the special pilot projects for the production and distribution of science teaching equipment in Member countries with special problems of basic educational development consisting in the establishment or extension of national centres for the production and repair of science teaching equipment and in mobile units of physics teaching equipment for areas with inadequately equipped schools. These proved a necessary complement to science teaching pilot projects, demonstrating how the introduction of new subject-matter should be linked with teacher retraining and the use of new teaching aids. In most cases the participating countries felt the need to continue and extend these activities on the basis of the experience acquired as a result of the OECD sponsored projects.

F. Preparation of teachers

That teachers should play a key role in bringing about curriculum improvement is implied in much of what has been said earlier in this chapter. In the OECD sponsored projects in science and mathematics teaching, as well as in other curriculum development projects in the Member countries, the in-service training of teachers and the production of teachers' guides to the new textbooks and other teaching aids formed an essential part of the approach. In some projects access to the new material has even been made dependent upon the accomplishment of training in its use.

The recognition of this need for teacher retraining is reflected in the serious efforts undertaken in many OECD countries to prepare teachers for their new tasks. It is significant that the initial phase of the programme of the Committee for Scientific and Technical Personnel concentrated heavily on teacher training and retraining activities, which were subsequently taken over by the national authorities. Institutionalised refresher courses are now an established feature in most Member countries. In Italy, for example, a great number of teacher refresher courses have been held to prepare the teachers for their task in the new "scuola media". In Belgium annual post-graduate summer courses for secondary school teachers, as a direct follow-up of initial OECD action, are attended in large numbers by both national and foreign teachers. In the United Kingdom, and even more so in the U.S.A. the summer courses attract impressive numbers of teachers. In Japan a tremendous effort has been deployed to retrain science teachers, through the "Science education centres", which, it should be noted, originated as a result of pressure by the teachers themselves and form now a well-organised network of systematic training facilities throughout the country.

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(1) This Service operates an International Science Film Reference Library, containing some 1,000 titles.

Much of this work has revealed the difficulties in keeping the teachers continuously informed about new content and methods of teaching. In pilot projects which involved only a limited number of selected schools it was relatively easy to mobilise the teachers for refresher courses, summer courses and seminars. It appeared much more difficult to involve in such activities large groups of teachers, if this implied extra work and extra time. On many occasions, therefore, it has been recommended that special provisions be made for the teachers' regular in-service training, and a system of leave of absence or of sabbatical periods has been advocated.

The problem of how to mobilise the teachers for educational innovation has to be seen in the perspective of a process of life-long training of the teacher, which can only come about if curriculum development becomes the teachers' own cause. Too often in the past, work on curriculum reform was experienced by the teachers as a burden imposed on them from the outside.

A more organic involvement of the teachers, as advocated here, would presuppose a certain amount of basic research experience in curriculum development, which is not now provided by their pre-service training. Teacher training institutions have in fact only rarely been involved in the past work on curriculum improvement and many future teachers were hardly aware of its existence. The task which lies ahead is to bridge in teacher preparation the gap between training and research and to involve the prospective teachers actively in research and development work. Teacher training colleges and institutes of education should ideally become the centres where curriculum research and innovation work is concentrated.

In the U.S.A. this problem has recently received much attention. The Panel on Educational Research and Development, in its March 1964 Report, recommended the setting up of "special curriculum units in practice-teaching sessions ... (to get) ... prospective teachers themselves involved in the process of curriculum development". (1) The Report finds that "in the in-service education of teachers, reliance upon research and development is doubly necessary". The "Twenty-Nine College Co-operative Plan" run by the Harvard Graduate School of Education lays great stress upon linking teaching experience with the academic study of subjects and teaching methods and with systematic research and evaluation of their teaching and the development of new approaches (1). In the United Kingdom the Schools Council "exists (above all) to sponsor the development of new teaching aids carried out by and for teachers" (2). In teacher training courses in Sweden "theoretical education and practical training will run parallel to a greater extent than formerly", (3) and thus the co-ordination between teacher training and academic training will be reinforced.

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(1) See "Innovation and Experimentation in Education", U.S. Government Printing Office, Washington D.C., March, 1964, p. IX.

Similar trends and examples from other Member countries could also be quoted. They all point to an urgent concern as to the adequacy of existing teacher training schemes in the face of present needs in education and to the crucial role which training colleges could play as the spearhead of innovation and progressive attitudes.

G. The key function of research and experimentation

Renewal means research and experimentation. "Rolling reform" implies the need for "rolling" research and experimentation. As in the case of modern industry, modern education rests on a basis of research and development work, where new ideas are tested, new methods tried out, the criteria for examinations and evaluation developed ; in short, where the "how" of education is conceived and determined.

However, the parallel with industry must be drawn with caution, for the "human factor" is in education not just one of the determinants ; it is the only one that really counts. Its "feedback" into the methods and means employed is so deep-going that these have to be continuously remodelled. This consideration has profound implications on the role of research and experimentation in education. The consensus and dissension about its validity affects profoundly the relative importance that is attached to "pure" or "applied" research in education.

It is at this point that development work in schools assumes its full importance. In education, more than in any other field, research and development work must go together. Real innovation in education takes place in the class-room, as it is there that it is decided how the increased investments are converted into better education. This implies that academic research, carried out mostly outside the schools, should be complemented with development research in the schools themselves, directed at enhancing the effectiveness of teaching and learning. Thus a bridge is built between research and innovation, the two elements in educational development which necessarily belong together, (1) and the discrepancy between educational research and what is happening in the schools is reduced.

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(1) See for a description of the Programme, "Schools of Tomorrow - Today", a report on Educational Experiments prepared for the New York State Education Department by Arthur D. Morse, N.Y., 1960, p. 159 ff.

(2) "Change and Response : The First Year's Work, October 1964 - September 1965", The Schools Council, HMSO, London, p. 13.

(3) "Secondary Education in Sweden", National Board of Education, Stockholm, 1965, p. 98.

In the OECD countries the place of research in education, both in the policy-making process and in the actual process of education, is far from being adequately defined. In several of them hardly any educational research is carried out and institutions and research workers for this task are simply not available. In a number of others, there is a considerable research activity, but its status and efficiency suffer from two major handicaps :

a) It has not yet been fully recognised as a discipline of academic standing and is consequently insufficiently, or not at all, represented at the universities ; in several countries its development as an experimental discipline is hampered by its integration in the faculty of philosophy. One of the consequences is the lack of suitable training for academic research workers resulting in inadequacies in the pedagogical training of teachers.

b) Educational policy is determined by all kinds of factors except the results of research. At best, ad-hoc research is called upon to help clarify particular details of policy decisions, or, post-factum, to determine the particularities of the implementation. In many cases this state of affairs is more the result of a traditional attitude towards policy-making than of the absence of research evidence. It is, however, obvious that both factors are intimately related : good research compels policy-makers to revise the bases of their decision-making, a favourable political climate is liable to create better conditions for research.

A strong stimulus for research into education has resulted from the importance attributed in modern societies to education as a relevant factor in economic growth. A great deal of the educational research carried out in the recent past has been concerned with this relationship. Great progress has been made in clarifying the interaction between education and the economy. However, this research did only marginally deal with the process of education as such, with its structure, methods and content. In the major educational reforms which in many countries took place after the last war, the lack of tested knowledge about the qualitative aspects of education was deeply felt. Both political and educational authorities are now becoming alive to the necessity to base the process of education as such on a sound basis of continuous research.

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(1) See : Michael Young, "Innovation and Research in Education",London, Routledge and Kegan Paul, 1965.

An increasing variety of institutions carry out educational research of some kind in most OECD countries : university departments of philosophy, sociology, psychology and, where they exist, of education, university teacher training departments, other teacher training institutions, special research departments in Ministries of Education or in School Boards, private foundations or, in a few cases, national pedagogical institutes or pedagogical institutes servicing private school systems. In only a very few OECD countries are all these types of research mechanisms available ; in a considerable number, only one or two such institutions exist.

However, even in the first, most privileged group of countries and *a fortiori* in the less "advantaged" the need has been felt for new arrangements and a considerable number of initiatives have over the recent years been taken to set up new research mechanisms. The reasons for this were mainly of two types :

a) The need for an overall approach to the educational system, as distinct from the research into, and the development of, particular sectors or fields of study ;

b) The need to make research the real centre of gravity of educational policy and of educational practice.

This need for, at the same time, more "fundamental" research and a better integration of research in educational policy and practice has been felt very strongly as a result of the work done on the development of curricula. Projects have been developed as the need or opportunity arose, in individual subject-fields and with no connection with the overall educational policy and reforms. The concentration on science curriculum development which resulted from this has been mentioned earlier in this report. The instigators of the curriculum improvement projects were often too much connected with particular disciplines to be interested in an overall approach.

To supplement this research work and assure its integration in educational policy it has not always been considered necessary to set up entirely new research and development mechanisms. In the *Netherlands*, for example, a Foundation for Educational Research was established in 1965, to co-ordinate research and educational policy and development. The Foundation will not initially carry out research itself but promote and create a sound research policy and an educational policy which acknowledge the results of educational research. It will advise the Minister of Education in matters of educational research and on the activity of the institutions responsible for the implementation of research results in education.

In *Sweden* the general lines of the applied educational research to be carried out are defined by the National Board of Education, in agreement with the Ministry of Education, but the National Board has full freedom in implementation. Most of this research is carried out at the research departments of the teacher training institutes with financial support from the National Board. Thus the co-ordination of the training and retraining of teachers with the applied research is strengthened. It is also the National

Board's responsibility to plan and promote the development work in the school system. "Pure" academic research, however, continues to be carried out mainly in the departments of education of the universities independent from the National Board of Education. In drawing up suitable projects representatives of industry, of teaching, and of other interested groups are consulted and their active co-operation is sought wherever it is needed. Research in specialised institutes is considered as only part of the work and emphasis is put on the continuous development work in the schools, in which the teachers themselves are directly involved.

In Norway the "State Board for Experiments in Schools" is responsible for a large variety of research and experimentation projects. Since many experiments cannot be carried out under the normal law regulating compulsory education, a great number of schools-actually one third of all schools in Norway - is placed under the competency of the Board. The research programmes undertaken by the Board cover nearly all aspects of educational development.

In Greece a National Pedagogical Institute has been functioning since March 1965 to promote both research and development work in education. Its connections with the schools and the promotion of development work in which schools and teachers are actively involved make the Institute the meeting point between research and innovations in the schools. In Portugal the new Educational Research and Planning Office in the Ministry of Education, set up in January 1965, is responsible for permanent systematic research on educational problems but its task comprises also the planning of development work in the schools. In Germany the "Institut für Bildungsforschung in der Max-Planck-Gesellschaft", established in 1965, acts as a central research institute for all the German "Länder". Curriculum research is *explicitly in its programme.*

What all these new mechanisms are trying to achieve is the osmosis between research and policy, between research and development and between research and the educational process. The key position of research in this interplay is clear, but so are its limitations inherent in every testing process : it has to be carried out in experimental and therefore in artificial conditions. As indicated earlier, there is all the more need that research, if it is not to remain arid and academic, should be complemented with development work in the schools.

Pilot projects have proved to be the most successful means to bridge this gap, as has been shown by recent efforts to improve education and, in particular, to improve school curricula. Their main aim is to help develop a strategy for the implementation of new approaches which have been formulated in the earlier research and experimentation stage. It is obvious that pilot demonstrations are in themselves a stage in the research and experimentation process, insofar as they allow alternative hypotheses to be tested.

In the OECD sponsored pilot demonstration projects the research aspect was implicit. The absence of a clearly defined experimental set-up in nearly all the projects was perhaps the most serious methodological weakness in their design. In most cases, however, the demonstrations were based on approaches, or adaptations of them, which had already been thoroughly tested in their original version (1) and the need for research and experimentation was therefore less urgent. The time-limit was an additional constraint. On the other hand full stress was laid on their development function ; the new approaches were adapted to the specific needs of the country in question, to the particular structure of its school system, to the objectives and methods of teaching, to the resources in terms of teachers, teaching aids and finance. Their most valuable contribution was that they demonstrated how the necessary resources can be created and developed : text-books were prepared, teachers trained or re-trained and teaching aids, including laboratory equipment, developed, produced and made available to the schools. In addition they had a significant catalytic effect on national educational policies and on national educational development efforts (2).

In these projects great care was taken that the pilot classes represented as truthfully as possible the actual conditions of teaching in the countries. This general concern that experimentation in new curricula and methods of teaching should not take place in artificial, laboratory-type conditions was reiterated forcefully in the conclusions of the September 1965 Seminar on School Science Policy at Frascati. "Pilot courses have a better chance of being successful if they are carried out under circumstances which resemble as much as possible those of normal school courses" (3). For the same reason the system of special experimental schools should in the eyes of many educationalists be used with prudence. In Sweden, for example, only one experimental school exists. It is felt that most of the research and experimentation is better carried out in ordinary schools and that only experiments which do not fit into the framework of these schools should be carried out in experimental schools. This is obviously possible in a country like Sweden, where curriculum development is being built into the school system ; but for the majority of countries envisaging reforms special experimental schools, or even school systems, provide the only means whereby new curricula and teaching methods can be tried out in a fully integrated way. Such schools have in fact recently been established, or are planned, in several OECD countries.

H. The role of co-ordinating mechanisms

The central theme of this report has been that curriculum development should be concerned with the total area of content and methods of teaching and that it should be part of the overall development of education. This means that changes in individual disciplines should be studied in their relationship to the development of the total curriculum, including all factors involved in the educational process - content, methods, aids (of which buildings and accommodation as well as apparatus and equipment form a part) teachers, evaluation of results. It also means that the promotion of curriculum development must be integrated in the overall educational policy, i.e. it should be related to the educational planning activity and to the decision-making process, to the actual management of education and to those who are directly responsible for the planning, the policy-making and the implementation, at all levels and in all types of responsibilities.

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(1) In particular, science curriculum material developed in the U.S.A.

(2) The already mentioned Progress Report DAS/STP/64/8 (OECD Document) analyses in detail the strategy followed in the projects.

(3) Conclusions of Group 1.

This calls for a major effort in co-ordination which cannot be achieved on an ad-hoc, piece-meal basis. Perhaps the most valuable conclusion which has emerged from past efforts, some of them quite broad and sophisticated, is that curriculum development constitutes an essential and distinct function of an educational development policy, requiring special techniques, methodology, skills and resources. In several OECD countries this awareness has led to a rethinking of the administrative structure of the educational system so as to enable it to accommodate adequately the curriculum development function.

An illustration of this evolution is provided by the objectives of the new "Schools Council for the Curriculum and Examinations" in the United Kingdom, now generally known as the "Schools Council". It has grown "out of a recognition by all branches of the education service that co-operative machinery was needed to organise a more rapid, and more effective, response to change" (1). The Council assumes responsibility for most of the curriculum and examination work previously carried out by the Secondary Schools Examinations Council and by the Curriculum Study Group. The National Foundation for Educational Research in England and Wales, together with Universities and the Government Social Survey will be commissioned to carry out much of the research which the Schools Council judges necessary. Close co-operation is established with the Standing Conference on University Entrance on possible changes in Sixth Form courses. The Council has established a number of subject-committees. Most of the projects on curriculum development are sponsored jointly by the Council and the Nuffield Foundation, working in close co-operation, "broadly on the basis that the Nuffield teams are wholly responsible for the development of teaching materials, while the Council ... provides field services ... and evaluation." (2). The Nuffield Foundation intends to withdraw from curriculum development as soon as the Schools Council is ready to take over the whole of this work.

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(1) "Change and Response : The First Years Work, October 1964 - September 1965", The Schools Council, HMSO, London, p. 1.

(2) "Change and Response", op. cit., p. 13.

Thus the Schools Council functions as the brains trust of educational research and development work, drawing for the execution of the projects on all the existing educational research and development potential or, if this is needed, establishing the necessary ad-hoc framework. On the other hand the post of a Research Adviser to the Minister of Science and Education has recently been created. The task of the Research Adviser is to establish the link between the educational administration and the research and development work, both in the sense of co-ordinating this work with the administration's policy and of gearing this policy into the direction indicated by the results of the research and development work.

In Sweden curriculum development in this sense of the word is the responsibility of the National Board of Education. Its involvement with research and development concerning the school curricula is direct and explicit. It includes the full range of curriculum development from research to decision-making. For example, in the preparation and introduction of the 9-year comprehensive school and, much more directly, in developing and introducing the curricula for the new secondary schools, the Board has been entrusted with the task of defining the details of the internal school organisation, the general instructions for teaching, and the curricula.

In Norway the "State Board for Experiments in Schools", established as early as 1954, has now acquired a long experience in promoting educational development and research in all its aspects. The various social groups of the country are represented on the Board. Its impact on the quality of teaching as well as on educational policy is very great indeed.

In other countries the mandate of new mechanisms of this type is not as clear and/or comprehensive as in these three cases. It appears in many cases extremely difficult to define for a curriculum development mechanism a status which gives it the necessary freedom of action to carry out or stimulate creative research and development work, and, at the same time, ensures the necessary impact on the policy and administration of education. This is a major challenge which countries will have to resolve in the future in the light of the particular nature of their educational systems and administrations.

The distribution of central, regional and local responsibilities for curriculum development is, of course, dependent upon the administrative structure of each country's educational system. However, it follows from what has been said earlier that curriculum development can derive but very broad guidelines from national educational goals ; much more than other domains of education, it must be defined in terms of regional and local exigencies. If the curriculum development function is to be adequately performed, new mechanisms should be created at these levels. Their function would in the first place be to disseminate information about curriculum development work to schools and teachers, but also to promote and undertake innovation projects, and to re-define the available material in the light of particular needs and conditions and to adapt teaching material to the particular teaching situation in their areas. This makes it all the more necessary that curriculum development should increasingly become a direct concern of the schools themselves, which would, among other things, require that special arrangements are made in the schools' administrative set-up, especially in order to provide for specially trained staff for new functions reaching beyond the traditional scope of school teaching (1).

CONCLUSION

The changes which are taking place in the educational systems of all Member countries amount to nothing less than a major revolution in education. The developments - and hopes - recorded in this report, based on current, though at times tenuous, trends in the Member Countries relate to the very substance of this revolution and to the need to marshall the forces acting on the "how" and "what" of education in the interest of purposeful and orderly development. The report brings out the variety of methods, techniques and mechanisms through which the various Member countries are attempting to respond to the challenge, each in the light of its own particular circumstances. To the extent that it may have helped to elucidate the nature of the problem and the issues resulting from national experience with it, this report may have made a modest contribution to a better appreciation of the place of the curriculum in educational development policies.

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(1) See, for a discussion of these issues in the United Kingdom situation, "Curriculum Reform" by R. Irvine Smith, "New Society", 12th May, 1966, No. 189, p. 12 ff.

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